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Change and Indigenous Agroforestry in East Kalimantan

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A variety of important policy issues remain unresolved in the frontier province of East Kalimantan; and the Man and Biosphere research* reported here was intended to provide information to Indonesian scholars and policy-makers in their efforts to make these important decisions. Before proceeding to a discussion of our approach to this research and the actual findings, I will outline briefly some of these important policy issues we hoped to address.

Indonesia's Resettlement Program (Respen) is designed to move populations out of remote upland areas where they have little access to the services usually provided by the Government (e.g., healthcare, schools, transportation) into more accessible lowland regions. Besides the governmental interest in improving the quality of life of these hinterlands people, there is a general concern that shifting cultivation (their usual agricultural mode) is destructive of the forest environment and an inefficient method for food production. The efforts of Respen then have consistently discouraged the practice of shifting cultivation and encouraged adoption of sawah or wet-rice cultivation in the new lowland settlements. Some of the controversy about resettlement has revolved around the following issues:

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- . Does resettlement actually improve the people's quality of life?
- . Do they actually practice wet rice cultivation?
- . Are their shifting cultivation practices environmentally damaging?
- . Does their absence from the border areas constitute a national security risk?

This latter concern, for the time being, has effectively halted Respen's attempts to depopulate the border regions of East Kalimantan.

A second important policy issue is the appropriate role of timber companies in the province. Vast concession areas in East Kalimantan have been granted to timber companies for timber harvesting. This profitable business is partially responsible for the economic boom that characterizes East Kalimantan at this time; and the economic importance of the influx of foreign capital cannot be dismissed. But Indonesians---scholars, bureaucrats, and policymakers alike---have concerns about monitoring the activity of timber companies. Specific concerns include:

- . How environmentally destructive are the lumbering activities?
- . How can and should the conflicts of interest between timber companies and resident populations be resolved?
- . How have these populations traditionally utilized the forests, and what rights should they have with regard to the forests?

A third important issue in East Kalimantan revolves around the Transmigration program which has brought many Javanese to the province and includes plans to increase that number considerably in the next few years. In the early years of the Transmigration program, governmental planning was founded on a concern to drain off Java and Bali's excess population into

the sparsely populated Outer Islands. Now, the emphasis is on utilizing the human resources of Java and Bali to develop the potential of the Outer Islands. However, the program remains controversial, and we were concerned about the likely impacts of the planned influx of Transmigrants on the forests of East Kalimantan. Specific questions that have been raised include:

- . Can East Kalimantan's environment support the population densities currently planned?
- . Does the quality of life of the Transmigrants improve in their new locations?
- . What is, or will be, the impact on existing populations in the area?
- . What is, or will be, the impact on the environment in the area, specifically the forest?

The above three issues are the most widely discussed in East Kalimantan today; but another dimension, or potential policy issue, emerged in the course of my own study in Long Segar, a Resettlement village in the province. That fourth dimension relates to the relative position of women in the dynamic and changing environment of East Kalimantan. Some questions that emerged as important to consider include:

- . How are current development efforts affecting women (as half of the population)?
- . What are the productive activities of women in East Kalimantan?
- . What activities of women influence the overall quality of life, (e.g., population, health, income generation, education, etc.)?
- . Is it really necessary to single women out in development efforts, or can they be assumed to benefit from programs directed at household

heads (KK's)?

My perception of the best answer to this last policy question is implicit in the very posing of these questions.

The Research Sites

Most of the research on which this analysis is based was conducted in Long Segar, East Kalimantan, where I lived and worked from October 1979 thru August 1980. The comparative data from Long Ampung were collected in May and June 1980. Long Segar is a Christian, Uma' Jalan Kenyah (Dayak) village, located approximately 142 air km from the provincial capital, Samarinda, in Kecamatan Muara Wahau. The village was gradually settled by the present inhabitants who moved on their own initiative from their remote homeland near the Malaysian border between 1963 and 1972. In 1972, Long Segar, Kernyanyan and Long Noran (neighboring Kutai and Uma' Kulit Kenyah villages, respectively) became a formal government-sponsored Resettlement Project; and since that time they have received a variety of kinds of assistance (e.g., housebuilding and agricultural tools, seeds and seedlings, extension efforts, and agricultural machinery).

Long Segar currently has approximately 1,000 inhabitants almost all of whom gain their livelihoods by means of shifting cultivation. This is supplemented in some cases by wage labor, sale of agroforestry products, and cottage industry. The village is situated within an American timber concession, near a plantation pilot project, and is accessible by plane (one half hour), speedboat (9 hours), and longboat (36-48 hours) from Samarinda.

Long Ampung (the home village of Long Segar's residents), with a

population of 505 (census: 6/80) is located near the Malaysian border in Kecamatan Kayan Hulu. At present it is not accessible by air or water, and requires a day's fast walk from the nearest airstrip. Consumer goods, particularly salt, cloth, tobacco, sugar, beads, kerosene and cooking pots, are carried in on men's backs for the most part; though occasionally supplies are dropped by the Government from lowflying planes. Kenyah men have a long tradition of undertaking expeditions to Malaysia and other more distant places to procure such goods. With the above exception the community is self-sufficient. As in Long Segar, shifting cultivation forms the economic base, with rice as the staple food, supplemented by vegetables from gardens and forest produce.

On Situational Analysis

This research was part of an Indonesian-U.S. Man and Biosphere project entitled "Interactions Between People and Forests in East Kalimantan."

It was undertaken within a conceptual framework* derived from the expanding body of literature substantiating the notion that people's behaviour and beliefs are mutable and responsive to changing external conditions. We considered this perspective to be particularly appropriate in a frontier environment like East Kalimantan, where human creativity and adaptability

*We were influenced by such works as Hoben's (1979) and Miracle's (1970) work on the decision-making capabilities of rural peoples; Moore's (1975) treatise on "situation adjustment;" and Castillo's (1969), Hutton and Cohen's (1975) and Helleiner's (1975) presentations of data on the rationality of rejection of some externally advocated innovations. The perspectives provided by Eckaus (1977), Hoben (1979), and Hill (1970) on the great range of variation in the conditions under which rationality is exercised, as well as the views of Barker et al. (1977), Chambers (1974) and Vayda (1979) on the practical knowledge that people gain thru experience about the varying conditions under which they must make decisions and act, have helped to shape our approach to this research project.

were so much in evidence.

Within our overall concern to address "problems" or policy-relevant issues, we selected specific human actions as our focal point for research. We then investigated all factors (insofar as possible) that had an impact on or were affected by that action. In this way, with the problematic human action at the center, we were able to trace the significant components or factors outward, and develop an understanding of the complex, intertwining, mutually affecting influences and impacts that comprised the context for that action. This approach is consistent with the study of situations advocated by the philosopher, Karl Popper (1972). Our approach provides a useful technique whereby the holistic advantages of ethnographic research, with its recognition and description of the complexities of interacting causes and effects characterizing social behaviour, can be maintained at the same time that the focus required by policymakers can be achieved.

In the research reported here (the portions of the above project conducted from the Long Segar base), one problematic human action that served as a core was cutting down the forest. An important divergence from traditional anthropological methods must be reiterated here: The community of Long Segar was not the boundary for the unit of study in this research. It was, rather, an entry point from which the action of cutting down the forest could be viewed and better understood. People, including those who cut down forests, live in communities, and an adequate understanding of the factors that influence these actors includes a thorough understanding of the social context in which they operate. Participant observation was therefore my most basic research tool.

The situational approach required that I pursue factors and influences outside the community whenever these seemed relevant. In an effort to

understand why people cut ironwood to make lumber, for instance, I had to investigate the Indonesian Government's rulings on such harvesting, the customary actions of timber companies from whose concessions such timber was cut, and the price paid for such products in Samarinda, as well as the more typical kinds of information that might be collected in a standard ethnographic study (e.g., the feasibility of such endeavors given time allocation requirements of traditional agricultural practices; values and beliefs about the forest and its products; local availability of chainsaws, gasoline, and other technological aids; and so on).

As my understanding of the critical factors relating to forest cutting activity improved, I was able to devise more narrow studies to quantify behaviour and beliefs that had impacts on this action. Specifically I completed a study of land use since resettlement, a time allocation study, a study of female decisionmaking and male migration in the two communities, a demography in the two communities, and a study of inter-generational change in forest-related cognitive mapping and attitudes. The results reported in this paper are based on participant observation, the time allocation study, the study of cognition (Galileo), and some preliminary analysis of the other studies mentioned.

The Kenyah as Agroforesters

The forest cutting activities of Uma' Jalan Kenyah in Long Segar are related principally to their dependence on agroforestry* as an economic base.

*In Jessup's (1980b) paper on shifting cultivation in Sungai Barang, he identifies their system as a form of agroforestry, rather than agriculture, with the people utilizing the areas that have formerly been considered 'fallow' for products other than rice. This interpretation is much more reflective of the actual situation, both in the Apo Kayan and in Long Segar. See "Production, Consumption and Commerce" below for an elaboration of the Uma' Jalan agroforestry systems.

The following discussion of agroforestry as it is practiced in the two Kenyah communities, Long Ampung and Long Segar, focuses on change,* in an attempt to shed light on the important factors that are relevant to policymakers.

The most obvious reason that Kenyah consistently cut down the forest is to make dry rice fields. Rice forms the basis of their subsistence, and other economic activities are seen as supplementary. Indeed, the central, symbolic role of rice in Kenyah life has contributed to a more general misperception of their activities, such that the other important elements in their agroforestry system have been inadequately attended to. Kenyah call themselves farmers (petani), considering this important in distinguishing themselves from those forest dwelling peoples such as the Punan who do not cultivate rice (gaining subsistence by hunting and gathering) and whom the Kenyah consider inferior. Rice cultivation has also traditionally been an important symbol of women's role: where boy children are desired because they go on expeditions, girls are preferred because they make ricefields. The comparatively high status of Kenyah women implied by their responsibility for a sphere of life deemed so important (i.e., rice) is obvious in daily life.

But the facts that the Kenyah cut down forests to make ricefields and attribute primary importance to those ricefields have obscured the importance of Kenyah use of those fields after the rice has been harvested. Kenyah

*I recognize the danger in considering the differences between these two communities as representative of "change", with Long Ampung considered stagnant and Long Segar changing. One important change in Long Ampung itself is the population. In 1978, only 4,896 of the 1970 population of 8,551 people, remained in the kecamatan Kayan Hulu, where Long Ampung is located (Vayda and Colfer 1979:3). But there is general agreement among the Kenyah that life in Long Ampung is not radically different now from the life Long Segar's inhabitants lived when they were there.

dependence on the forest, at varying stages of regeneration, for both animal and plant food, for other minor forest products, and for timber, has been underestimated; and justifies considering their economic system to be based on agroforestry rather than agriculture alone.

In recent literature there has been a recognition that shifting cultivation takes many forms and that those forms can have different impacts on the forest (e.g., Grandstaff 1978; Kunstadter, Chapman and Sabhasri 1978; Pelzer 1978; and others). The following analysis focuses on the important differences in the Kenyah agroforestry system (usually referred to as shifting cultivation) as it is practiced in the remote Apo Kayan (Long Ampung) and in the more accessible lowland region of the Telen River (Long Segar). The most significant differences fall into three categories: Environmental, technological, and commercial.

In many ways, assessment of the human impact on the forests of Kalimantan is reminiscent of a dilemma identified by Solzhenitsyn:

If only there were evil people somewhere insidiously committing evil deeds, and it were necessary only to separate them from the rest of us and destroy them. But the line dividing good and evil cuts through the heart of every human being. And who is willing to destroy a piece of his own heart. (The Gulag Archipelago)

The creativity that allows people to improve their quality of life, the responsiveness to changing circumstances that allows people to make adjustments necessary to survival, these are the flip sides of the coin that results in widespread destruction of the forests (as well as other portions of the environment).

In the following discussion I hope to use the changes that the people of Long Segar have made in their way of life, in response to their changed circumstances*---particularly environmental, technological, and

*Remembering that they chose a path that required their adapting to changed circumstances when they decided to move to Long Segar.

commercial---to demonstrate how the destructive and the creative are welded together in the human capacity to think, invent, react in ways that are perceived as beneficial to those who comprise the significant members of one's world. I confess at the outset to a tendency to lean toward what has been called "the populist fallacy" (International Seminar 1977); but I would defend that bias as a reasonable response to a longstanding tradition in development and environmental circles of seeing the activities of rural peoples in general as characterized by hidebound traditionalism, and shifting cultivators in particular as engaging in rampant, uncaring destruction of the environment. I hope, in the following analysis, to show the creativity and opportunism that results both in demonstrable environmental damage, and in real improvement in the current quality of life for Long Segar residents.

Environmental Differences

Flying northwest from the lowland Long Segar region to the Apo Kayan, environmental differences are striking. The flat landscape with occasional communities visible along the rivers, and the patchwork effect of fields, secondary and primary forest areas, give way to mountainous terrain, covered by primary forests with few indications of human habitation.

Long Ampung (1°42'N, 114°51'E) is located on the Kayan River, between Long Sungai Barang (25 km east, upriver) and Long Nawang (25 km north, downriver), both of which have airstrips which are served at irregular and unpredictable intervals by Mission Aviation Fellowship (MAF). The downstream canoe trip to Long Nawang is a mere three hours; but the journey is dangerous due to rapids, and returning is an arduous eight hours, mostly poling. Between Long Ampung and Long Sungai Barang, the Kayan River is impassable because of the rapids; but Kenyah can make the trip on foot in one day.

The people of Long Ampung have lived in their current site since approximately 1918, moving from a site about half an hour downstream (Long Anye) where people still go to harvest fruit trees and collect minor forest products like bamboo. This comparatively stable residence is contrary to prevalent stereotypes about shifting cultivators, but is congruent with the patterns of other groups in the region. Before people began moving away in the early 1960's, in search of trade goods, schooling and medical care, Long Ampung supported a sizable population.* Related to the length of residence and the recent population size, all the forest in the area around Long Ampung is secondary growth. The one exception is a small plot of primary forest in soil that is considered inferior, and which is preserved to provide timbers for house construction and other such uses (see Jessup 1980b:1, on a similar plot in Long Sungai Barang).

Although detailed soil analyses are not yet available for the area, we do have indications that soil in Long Ampung is better than in Long Segar. The people of Long Segar habitually remark on this when comparing their agricultural endeavors in the two locations. This opinion was substantiated by the field observations of Kuswata Kartawinata and Herwasono Soedjito (Director and researcher, respectively, Herbarium Bogoriense). Kuswata, in describing the Long Sungai Barang situation, notes "...a variety of soils, ranging from 'black', brownish yellow, yellow to 'white' soils." (1980:2). He elaborated that the Apo Kayan is characterized by small pockets of many different kinds of soil, including volcanic (personal communication 25/6/80)

*Long Segar residents can name twelve longhouses in Long Ampung in 1965 (conflicting with Whittier's data 1978:99), with the largest having 67 doors. The current four longhouses range in size from 8-28 doors, averaging 17.25 doors per longhouse. One "door" averages about 7 inhabitants. The 1965 population was probably around 2,000, according to my best guess.

Probably related to the greater fertility of the soil, the forest regeneration process is speedier in the Apo Kayan area, taking 5-10 years, rather than 10-15 years as in Long Segar, before a field is reusable for dry rice cultivation, in spite of the altitudinal differences (Table 1) that would lead one to expect the reverse.

Topographically, the Long Ampung area is characterized by steep hills and narrow valleys, with many rushing rivers and streams. The land is fragmented by these rivers, precluding the large expanses of field that are so detrimental to forest regeneration; and the presence of rocks, boulders, and small cliffs further interferes with the clearing of wide expanses. The rivers are fast, clear, and full of small rapids and waterfalls.

The main hazards to crops in Long Ampung are the animals that inhabit the surrounding forests: Monkeys, bears, deer, birds, and mice. Because of the quantity and persistence of these beasts, fencing fields is usually necessary. The presence of animal pests and the resulting necessity to fence are two factors that encourage people to make their fields in close proximity to one another. One person can guard a group of fields as easily as one field; and the mere presence of more people inhibits the animals to some degree. Additionally, the amount of fence construction per family is reduced when fields are made together. Fencing, like the felling of large trees, is one of the agricultural tasks customarily performed by men.

With regard to fence construction, it is worth noting that people from different villages cooperate to minimize the amount of fencing necessary. One of the most distant field groupings (Sungai Lesong, 2 hours upriver from Long Ampung) included 17 fields within one fence. Within that fenced area were three distinct sub-areas, separated by small patches of forest, and belonging respectively to two longhouses from Long Ampung* and one from Long Uro'

*The 12 fields belonging to Long Ampung residents comprised an estimated 22.5 ha.

(a Lepo' Tau Kenyah village half a day's journey upriver from Long Ampung). Individual fields tend to include mixed topography, with areas of steep slope as well as flatland. There are frequently small patches of trees here and there in a field---along small streams, in stony areas unsuitable for cultivation, or near prized fruit trees. The small size of field groupings*, combined with the frequent presence of stands of trees within the field proper are helpful in the forest regeneration process.

In the move to Long Segar, a variety of adjustments were made in response to environmental differences. Long Segar is located on a major river, the Telen, which offers only one significant and occasional barrier (the rapids one hour downstream) to access to Samarinda. The Uma' Jalan moved to Long Segar from Long Ampung in a gradual procession beginning in 1963, and terminating in 1972 when Long Segar became the center of the Respen Project.

Prior to the Uma' Jalan arrival, there had been a small settlement of a few Kutai people (the nucleus of the Muslim community now called Kernyanyan directly adjacent to Long Segar) in the immediate vicinity; and land histories of all Long Segar households provide only occasional reference to prior use of land by Bahau people. The availability of land was one of the reasons the Uma' Jalan chose this site. Uma' Jalan men and women, scouting for a village site closer to commercial centers, originally heard of this area from the current village headman's son who was married to a Kayan woman from upriver (Kayan Melah), near the confluence of the Marah and the Telen Rivers. The scouts were welcomed by neighboring villages and encouraged to settle in

*Long Segar residents maintain that large clusters of fields were common in Long Ampung, as they are in Long Segar, before the "exodus." It may be that population density is the critical variable in determining the size of these clusters.

the area. This, combined with the prevalence of primary forest, attests to the lack of population pressure on the land in the recent past.

Since 1969, this area has been part of an American timber concession. But, because the region near Long Segar has been determined to be forested with "nonmerchable timber" (i.e., insufficient quantities of the export species, notably meranti and kapur), the people of Long Segar have had a relatively free hand in their use of the forest.

The people of Long Segar, in contrast to some other shifting cultivators of Kalimantan (Vayda 1961; Dove 1978; Jessup 1980a; as well as many members of the neighboring Kutai community), prefer making their fields in primary forest if at all possible. Indeed, the people of Long Ampung expressed this preference too, but could not act on it because of lack of primary forest available to them. In line with this expressed preference, almost all fields made by Long Segar residents since resettlement have been in primary forest* (totalling an estimated 11,600 ha between 1963 and 1980, Azier 1980). Of the 1979-80 fields, 82% were in primary forest. Long Segar residents who make fields in secondary forest usually do so because of a shortage of men during the felling season (due to absence or illness), or in recent years, to minimize traveling distances to their fields.

An analysis of the soils and other climatic factors 30 km upriver from Long Segar has recently been completed (LEAP 1980), supporting the less formal observations of botanists and soils specialists who have visited Long Segar. Typical soils in the area (an area not marked by soil diversity) are deep loams, of low fertility. The areas along the rivers are somewhat more fertile, due to alluvial deposits; but no soils in the region were rated as more than "marginally suitable for continuous dryland arable farming,

*This may technically include some very old secondary forest, as well.

due to the inherently low soil fertility." (1980:25).

Topographically the area is flat compared to Long Ampung. Slopes of 0-8% are "common," with slopes of 15-25% "more rare." (LEAP 1980:27). The gently undulating nature of much of the land in the area means that large groups of families can make their fields adjacent to one another. The 1980 harvest included one grouping of 67 adjacent families (an estimated 160 ha), with none of the clusters of trees within the fields so often observed in the Long Ampung area. Forest regeneration under such circumstances should require much longer than in the smaller, tree-studded clusters of fields.

Annual rainfall in the area is $2,345 \pm 629$ mm, with no months with mean average rainfall less than 125 mm (records from 1929-80, Muara Wahau). The combination of flatland along the rivers and high rainfall are contributing factors in the frequency of flooding in the area.*

The Telen River, on which Long Segar is located, is a broad, winding river, full of silt. The resulting brown muddy appearance contrasts sharply with the crystal clear waters of the Kayan and other rivers near Long Ampung. Richard Bower, soils specialist and regional planner with Transmigration Area Development, a German-Indonesian development project in East Kalimantan, has observed that the rivers whose headwaters included heavily logged regions (like the Telen at Long Segar) were markedly muddier in appearance than rivers coming from unlogged areas (personal communication 7/80). Loss of soil due to runoff and erosion are legitimate concerns because 1) the rains fall on denuded**forest land with high intensity, washing away the fragile

*Some maintain the timber companies' logging activities have increased the flooding of both the Telen and other Kalimantan rivers in recent years (e.g., Adicondro 1979; Pak Jamar 1979 (personal communication); and others).

**The forest lands are denuded by shifting cultivation and by logging activity. Timber company personnel near Long Segar estimate that they disturb 30% of the soil wherever they log, and their extensive road networks require clearcutting along roads for necessary sun hardening of road surfaces (to maintain access to logging areas).

topsoil, and 2) the rivers' flooding periodically removes soil from along its banks in huge landslides. With the increasing human activity planned in this region---continued logging activity and increasing local populations (through spontaneous and Government Resettlement and Transmigration efforts) that will inevitably further disturb the forest---loss of soil may become an important problem.

The frequency of flooding in the river valleys combined with the greater fertility of land there have persuaded many Long Segar residents to make one field in a lowland area subject to possible flooding and another in a hilly region some distance from the river. Of the 1979-80 fields, only 3% included mixed topography, compared to 29% of Long Ampung's 1979-80 ricefields. The fact that droughts have greater negative impacts on harvests in the hilly regions further encourages people to adopt this two pronged approach if their human resources permit it. In Long Ampung many households have two fields, but their fields included a large one some distance from the village and a small one close by for easy access. Droughts and floods are not significant problems in the Apo Kayan, and need not enter into agroforestry decisionmaking.

The comparative scarcity of bothersome forest animals in the Long Segar area also obviates the necessity to fence fields. The presence of the numerous people who populate large clusters of ricefields is sufficient to keep the animal nuisances to a minimum.

A summary of the major environmental differences is presented in Table 1 below:

Table I
A Summary of Environmental Differences
Long Ampung and Long Segar

<u>Environmental Feature</u>	<u>Long Ampung</u>	<u>Long Segar</u>
Soil	more fertile	less fertile
Topography	hilly, segmented	flat, rolling
Floods	rare	frequent
Forest	secondary	primary
Altitude	<800 m a.s.l.*	<40 m a.s.l.*
Temperatures	cool**	hot**
Agricultural hazards	animal pests	floods, droughts

*Long Sungai Barang is 800 m a.s.l.; Muara Wahau is 40 m a.s.l.

**Monthly mean temperatures at Samarinda are 25-26° C. with mean maxima of 30-32° C. and mean minima of 18-10° C. Temperatures at Long Segar are likely to be a bit warmer as it is further inland (LEAP 1980:8). Temperatures at Long Ampung are definitely cooler: fires are lit for warmth in early morning.

Adoption of New Technology

Numerous changes, of course, have occurred in the people's move from Long Ampung to Long Segar (see Table II for a partial listing); but the adoption of three technological innovations has had profound impact, both on the people's forest-clearing activity and, in the case of two of those innovations, on the relative autonomy of women. The three important technological innovations are the outboard motor (or ces), the rice huller, and the chainsaw.

Technology, in Long Ampung is simple. Because of transportation difficulties, it is essentially impossible to utilize any kind of machine that is run by an internal combustion engine. In 1980, gasoline cost Rp. 750/liter and was rarely available, even if the money had been. Transportation, in most cases, consists of walking. Canoes are used where feasible, by both sexes, but the many rapids prevent their use in many instances. When things must be transported, men, women, and children use large back-baskets, woven from forest products.

A very time-consuming activity in Long Ampung is the hulling of rice, which is done with a large wooden mortar and pestle every afternoon on the verandah of the longhouses. The rhythmic sound of the pounding marks a time of day (3-5 P.M.) in Long Ampung conversation. Every-one pounds rice, though women tend to spend more time at it than men.

The felling of trees, which must be done every year in the preparation of a ricefield and also whenever lumber is needed for other purposes, is done with an axe or the large knife that Kenyah men and women carry everywhere, slung at the hip. Everyone participates in forest clearing, but the

Table II

ACCESS TO SELECTED FOREST PRODUCTS
Long Ampung and Long Segar

Product	Long Ampung	Long Segar
<u>sang</u> (Licuala) - sunhats	-	+
bamboo - construction, baskets	++	+
<u>tepo</u> (?) - mats, food	++	+
pandanus - mats	++	+
rattan (<u>seka</u>) - baskets, tying	-	++
<u>nanga</u> (Eugeissona - roofs, walls)	+	--
<u>tika</u> (Cyperus haspans) - mats	+	--
pineapple	++	+
ironwood - construction, pepper poles	-	++
meranti - construction, sale	-	++
firewood	++	++
<u>tat</u> (Cra Toxylon clandestinum) - shingles, house construction	++	++
<u>sip</u> (Stachyphrynium jagorianum) - roofing	+	--
damar - lighting, caulking	-	-
edible ferns (e.g., Stenochlaena palustris, Diplazium)	++	+

Key: --: none, -: far, +: exists, ++: abundant

large trees are felled by men. In general, the work of the Long Ampung Kenyah is arduous, with human energy providing for most human needs.

In Long Segar, access to the three technological innovations mentioned above---the ces, the rice huller, and the chainsaw---has made an important difference in the return on human labor expended. Life is easier.

The outboard motor, or ces, is an unusual variety: a glorified lawnmower motor with a 2-1/2 m shaft which extends horizontally out behind the canoe. The driver can control the depth of the propeller/shaft and the direction of the craft, by manipulating a handle which extends forward from the body of the engine. It is an ideal craft for river travel, as the rivers are strewn with floating wood and other litter which are a constant menace with more conventional engines. In July 1980, the cost of gasoline in Long Segar was Rp 250/liter. A generous estimate of the total cost of operating a ces (including cost of engine (Rp. 150,000-Rp. 195,000), gasoline, oil, replacement parts) was Rp. 600/hour.*

The ces came to Long Segar in 1977, and apparently "caught on like wildfire." By February 1980 only 26% of Long Segar's households were without a ces. Primarily used for going to ricefields, it also facilitates visiting friends and relatives in other villages, seeking medical care, and marketing produce in the nearby timber camps. Elders are already complaining that the younger generation does not understand the "theory" of paddling canoes.

That the ces has made Long Segar life easier can hardly be denied; paddling (or worse yet, poling) upstream is no joyride, if it must be done as a regular part of life. The ces' widespread use in the area is too

*The value of labor in Long Segar is discussed below.

new to assess its direct influence on the environment---most notably the river. It may, in the long run, adversely affect the fish supply, which as yet is still abundant.

The indirect effects, in the form of releasing human energy for more extensive utilization of the forest, are more obvious. The ces grants people access to much wider territories than they could effectively use before. So they can go farther, and they have more time once they get there. The impact of these facts on the forest will become clearer when the commercial factors are discussed below.

Though all people in Long Segar appreciate access to the ces and the time it saves them, the advantages to the women must be weighed against a potentially very important loss: their own autonomy. Kenyah women, long used to managing without their men from time to time, customarily decide how they will spend their days. They are active in agroforestry decisionmaking, and other people rarely tell them what to do. Without the ces women and men were equally mobile, within the vicinity of the village and the ricefields. But one trait of the ces --- its weight --- represents a serious constraint for women when they would like to go forth alone. A seemingly inconsequential characteristic of a machine has the potential for seriously eroding one aspect of female autonomy (which is generally considered to be an important component of high female status overall).

The gasoline-driven rice huller is another innovation that was eagerly seized by Long Segar's people. Where in the past they had to spend perhaps two person-hours per day per household pounding rice, now enough for a week can be hulled in a very short time. The cost is one kilo of hulled rice from every kaleng* of machine-hulled rice. One kilo of hulled rice cost Rp. 200 in July 1980, three months after the end of harvest. The blistered

*A kaleng holds 18 liters or 11 kilos of unhulled rice.

hands and aching backs that characterize the hand hulling process in the minds of Long Segar residents are attested to by observations in Long Ampung where the gruelling work is still a daily necessity. The people recognize that machine hulling wastes more rice, and in times of shortage a few people reported hand hulling their rice. There is no general awareness yet that the nutritional contents of machine-hulled rice are less than in hand-hulled rice.** There are four rice hullers in Long Segar, two of which were operating regularly in 1979-80. All rice is hulled by machine. The impact of this most welcome technological innovation on the forest again is indirect, in the form of freed human energy. The time spent hulling rice can now be spent in other activities. The Kenyah value hard work and industry; and are most likely to utilize their free time in other economic pursuits. Further harvesting of the forest around Long Segar is an extremely probable direction for this added human energy to take.

The deleterious effects of rice hullers, specifically on women, reported for Java (e.g., Collier and Soentoro 1978; Safilios-Rothschild 1980) have not occurred among the Kenyah. Displacement of women from sources of cash income is the problem in Java; in Kalimantan these women were never dependent on a cash income, both men and women traditionally hulled rice, and surplus labor is not a problem.

The chainsaw, with its obvious and direct impacts on the forest, came to Long Segar in 1975. It is among the most valued of potential belongings, costing Rp. 400,000. In 1980, 28% of the households of Long Segar had a

**It is possible that reduced nutritional level (which is further substantiated by a reduced amount of wild foods to supplement the diet in Long Segar) may result in more illness. This in turn could reduce people's time and energy available for forest harvesting and other activities affecting the forest. Preliminary findings, indeed, suggest that the health status in Long Segar is inferior to that in Long Ampung. But my general impression is that this one factor is more than compensated for by the time available due to technological innovations.

chainsaw, and the percentage has been increasing. The chainsaw can be used both in the traditional forest-clearing activities connected with the dry rice cycle (making a considerable difference in the amount of time required to clear a field*) and to make money. The fact that Long Segar ricefields are almost all in primary forest (distinguishable primarily by the presence of very large trees) makes the chainsaw even more desirable in Long Segar than it would be in Long Ampung where secondary forest predominates.

A man---and NOT a woman---can hire himself and his chainsaw out to his neighbors and family to clear land for ricefields at Rp: 5,000-7,000 per day (fieldowner buying fuel and food); during slack periods in the agricultural cycle, he can clear forest at the nearby plantation for Rp. 5,000 per day; or he can go to work as a logger for one of the timber camps that dot the East Kalimantan map. Such companies, in the Long Segar area, now hire loggers and their chainsaws, rather than supplying the chainsaw as was previously common practice. There, if he is strong and industrious, he can earn as much as Rp 150,000 per month, though a more usual figure would be Rp 100,000 per month. The local American timber company pays such loggers Rp 150 per cubic meter of timber cut.

A third use to which a chainsaw can be put is to make boards and beams. Beams, for instance, are cut in the forest and sold in the forest (Rp 15,000 per cubic), in the village (Rp 25,000 per cubic), or in Samarinda (Rp 45,000 per cubic). Two men with one chainsaw can expect to cut 1-2 cubics per day. From the above discussion, it is clear that from a "standard of living"

*Local people estimate that one man with a chainsaw can equal ten men with axes and knives.

perspective, acquiring a chainsaw and using it are rational actions which result in clear benefits for the particular family in question.

What then are the impacts of this innovation on the forest? If people can fell ten times as many trees in one day with a chainsaw as they can by traditional means, this is a substantial change in the "balance of power" between people and forests in East Kalimantan. The availability of the chainsaw has meant that one family can potentially clear a much larger ricefield (a factor that is particularly significant taken in conjunction with the increased time available to the people from adoption of the ces and the rice-huller). Field sizes are measured by kalengs of rice planted. In Long Ampung, the average field size for 1979-80 was 4.90 kalengs; for Long Segar 6.26. This discrepancy reflects an even greater real difference in size of fields: 1) the hillier topography of Long Ampung results in more wastage of seeds (as noted by the Kenyah); and 2) seeds are customarily planted approximately 0.5 meters apart in secondary forest fields (Long Ampung), but almost a full meter apart in primary forest fields (Long Segar). Fifteen Long Segar fields, randomly selected, were measured (with considerable help from Dr. Andreas Massing, TAD) in February 1980, with an average size of 2.22 ha. No comparable data for Long Ampung are available.

The more thorough clearing of fields that is now possible likewise has adverse impacts on the forest. A large tree which might well have been left standing in the past, and which could have provided seed in the forest regeneration process, is now felled without hesitation.

The impact of the chainsaw on the forest is intimately tied up with the role of timber companies in the area. Adicondro (1979:312) reports that "Due to the increasing anti-logging sentiments in Kalimantan, the provincial parliament of East Kalimantan even asked the government to ban the use of

chainsaws." This seems an improbable outcome, but testifies to the widespread awareness of the significant impacts of the chainsaw on the forest.

The chainsaw, like the ces, has a potentially negative impact on women. Although some women use the ces (banding together to carry it), none use the chainsaw. It is simply not suited to the physical strengths of women. In the agricultural cycle, the men can now do the main tasks for which they have traditionally had responsibility (the felling of large trees) in one tenth the time they used to require. There is no comparable technological innovation that cuts the remainder of the agricultural labor (the majority of which is female*) required. Women's labor thus becomes less efficient, relative to men's.

Obviously all the possibilities for supplementing cash income with a chainsaw are likewise unavailable to women. So women are further disadvantaged in terms of their access to cash---at the same time that money is consistently increasing in importance in the daily life of Long Segar. Indeed, the ces and the chainsaw themselves, as generally desired economic assets, are available only for cash. The importance for women of the inexorable forces pulling the Kenyah into the money economy will be explored from another perspective in the next section.

The presence of these three important technological innovations--- the ces, the rice huller, and the chainsaw--- have contributed significantly to an alteration in the interactions among men, women and forests in the Long Segar region, as compared to the Long Ampung area. These changes, freely chosen by the people themselves, have resulted in a physically easier lifestyle and a higher standard of living in Long Segar. But they

*Of the total agricultural labor, 54% is done by females, and 46% by males.

promise to have negative impacts on the forest ecosystem (see Peluso 1980, for similar findings) and on the position of women in the community, in the long run. Such impacts can be expected to result in an eventual lowering of the standard of living and of the general quality of life.

Production, Consumption, and Commerce

This section is essentially an account of the differences that result when the third element, Commerce, is introduced. To understand the changes and their impacts, we must first examine the system by which goods and food are produced and acquired in Long Ampung, in the virtual absence of commerce.

The crux or core of the economic system is a form of agroforestry composed of at least two important components: 1) a ricefield and its gradual transition back to (and including) primary forest, and 2) a number of special purpose plots that for one reason or another do not appear to be involved in the "normal" forest succession process.

Discussing the situation in the Apo Kayan, Jessup says,

Old fields and secondary forest communities provide a variety of foods and materials, which change as a community "ages," until it is cleared again and the successional process is renewed. Shifting cultivation maintains a "mix" of changing habitats, and since all of them are used and harvested for different products, it should be regarded as an agroforestry, rather than an agricultural, system. (1980b:2)

As depicted in Figure 1, forests of different ages provide different kinds of products that the people use. Although the Kenyah (and others) focus on the clearing of a ricefield as their "real" economic base, a glance at the kinds of products they obtain from subsequent successional stages shows the importance of maintaining this mix of changing habitats.

Interpreting Figure 1 requires remembering 1) that the forest changes from one labeled category to another (e.g., secondary to primary forest)

In a gradual process without clear boundaries, and 2) that the crops and forest products listed are merely illustrative. The vital importance of what has previously been called "fallow periods" and their ongoing productivity should be clear.

Figure I

Illustrative Ricefield and Forest Products
Long Ampung⁺

<u>UMA</u> (ricefield)	<u>BEKAN</u> (after crop)	<u>JEKAU BU'ET</u> (young secondary forest)	<u>JEKAU DADU'</u> (old secondary forest)	<u>MPA'</u> (primary forest)
rice	legumes		boar=====	
corn			deer=====	
peppers		ferns=====		
cucumbers			fruit trees+++++	
cassava+++++				
Banana+++++				
	Pineapple+++++			
		Eugeissona (nanga)+++++		
key:				
wild =	Stachyphrynium jagorianum (sip)+++++			
planted +	bamboo+++++			
			Cra Toxylon clandestinum (Tat)=====	
firewood=====		tepo*=====		
			ironwood=====	
			meranti=====	
				rattan=====
				Licuala (sang)=====
				pandanus=====
				Korthalsia echinometra(uei sanam)=====

*unidentified, used for mat weaving.

+Botanical identifications by Herwasono Soedjito, Research, Lembaga Biologi Nasional (1980)

Generally, the upper portion of Figure I refers to food products, and the lower to other kinds of useful forest products. Nauga and sip are used as roofing materials; tat is used for shingles and house construction; tepo (the core of which is eaten) and pandanus are used for mat weaving; rattan and uei sanam (a kind of rattan) are used for tying and for basket weaving; sang is a hatmaking material; bamboo is used as construction and piping material for carrying cases and basket weaving, and its shoots are eaten.

The other component of Long Ampung agroforestry, the special purpose plots, include:

marshlands - planted with wet rice, with pandanus, or harvested for wild tika (*Cyperus haspans*, another matmaking material).

buk (*Pteridium aguilinum*) lands* - planted with pineapple, cassava, or sugarcane.

special areas - e.g., a hill planted with nanga; a hill covered with edible wild ferns (paku), an old village site populated with bamboo; etc.

Combined, these diverse biotic communities provide virutally all the needs of the people of Long Ampung. Traditionally, the men have left in search of salt (the gold of the Apo Kayan), sugar, tobacco, cloth, kerosene, cooking pots and guns; but quantities have been limited by human carrying power.

Kenyah alertness to food and minor forest product gathering opportunities is striking. A trip to a ricefield to harvest some corn requires passing thru some secondary forest where some ripe fruit and edible ferns are observed and plucked. An abundant stand of bamboo is spotted from a canoe

*Buk is an indicator of infertile soils in Long Ampung, and considered to be comparable to infestations of *Imperata cylindrica* in other parts of East Kalimantan.

on a trip downriver, and all disembark to collect bamboo shoots. Kenyah men and women walk thru the forest like city dwellers saunter thru a supermarket.

The people of Long Ampung are aware of the existence of money, and indeed use it in interaction with outsiders (visitors or the Government); but on a daily basis, when people need something, they either get it themselves or ask for it. When someone has a surplus, he or she gives it away. Surplus rice and other agroforestry products are used, given away, or they rot, in most cases.

In 1980, the Resettlement Program chose Long Ampung as the site for a new Respen project, planning to move the people from Long Uro' and Lidung Payau (two Lepo' Tau Kenyah villages half a day's journey up the Kayan River) to Long Ampung (raising the population to about 1,419, Jessup 1980b:15). In preparation for this project, Respen has initiated the building of an 800 m airstrip, for which local people are being hired to clear and level the land. Daily wages for this work were originally intended to be Rp 1,000 per day; however, reportedly thru some sort of irregularity, workers were receiving only Rp. 500 per day in June 1980. Men and women were about equally represented on the work crews; but people did not find the wage tempting.

The airstrip is hoped to solve the very substantial problem of transportation and communication with the outside world. The Government is giving this problem special attention because the exodus from the Apo Kayan continues. People are aware of the advantages of living closer to commercial centers; they want ready access to consumer goods, medical care, and education. The military (Hankam), on the other hand, wants the borders of the nation protected; they are concerned that an empty Apo Kayan will invite guerilla activity on the Indonesian-Malaysian border.

Respen's current efforts in the Apo Kayan are an attempt to resolve these potentially conflicting desires, by providing necessary consumer goods from the outside and transporting possible cash crops from the Apo Kayan to urban centers by air. In the absence of help from the Government, however, similar airstrips at Long Sungai Barang and Long Nawang have not resulted in any kind of regular, reliable or profitable air service.

In contrast to the kinds of economic activities outlined in Long Ampung, Long Segar's involvement in the world of commerce is striking. Located on a major river that is regularly served by longboats and sporadically served by speedboats and planes, near a pilot plantation project and two foreign timber camps, Long Segar's people have regular opportunity to pursue many commercial endeavours. They can sell rice from their ricefields, vegetable produce from their gardens, timber and minor forest products from the forests, as well as their own labor.

The "traditional knowledge" of Long Segar's residents comes from Long Ampung. That a modified version of the agroforestry system in Long Ampung is still practiced in Long Segar is not surprising. The village is surrounded by a patchwork of botanical communities, providing diverse kinds of wild and cultivated food and products. The fact that the Long Segar region is predominantly primary forest has meant that a different balance of products is available. Table II shows some of the important forest products, with their differential distribution in the two locations (as reported by Kenyah informants)

The unavailability of some kinds of minor forest products in Long Segar coupled with the availability of commercial substitutes has resulted in a reduction of forest harvesting for personal use. Bamboo of large diameter are not found in this area; so plastic buckets have replaced their use as water-carriers. Nanga and sip do not grow in Long Segar; so people use ironwood shingles or, occasionally, tin roofing. The availability of kerosene and electricity* in Long Segar has meant that people need not travel the long distances in search of damar. Conversely, the presence of ironwood (a durable, longlasting wood) allowed Long Segar Kenyah to adopt its use in house construction, for shingles, and for pepper poles, discarding their traditional tat which also grows near Long Segar. The presence of sang, combined with regular access to cloth and a hotter climate, encouraged the far more widespread use and construction of Kenyah sunhats in Long Segar. The presence of sufficient quantities of rattan has allowed people to make most backbaskets of this more durable material rather than the bamboo more common in Long Ampung.

But forest harvesting has taken on a significantly different aspect with the availability of commercial outlets and trade goods. Far less time is spent in subsistence-related forest harvesting; far more in acquiring forest products to sell (notably timber). Money is an important part of daily life in Long Segar, and everyone uses it --- for salt, sugar, cloth, monosodium glutamate, coffee, tea, occasional tinned fish and packaged noodles; medical and educational needs; snacks in the small stores and eating stalls; village levies; as well as the technological innovations discussed earlier.

*There are four generators in Long Segar, only one of which is used for the sale of electricity to homes. When that generator is functioning, those homes which purchase electricity are lit from 6 - 10 p.m. All electrical use is controlled from the generator, and only lighting is available.

Money is obtained in two main ways, sale of agroforestry products and labor, and one subsidiary way, shopkeeping. Eleven families (three of whom are the only non-Kenyah residing in Long Segar) own small stores, buying most of their produce from the longboats that regularly ply the Telen, and selling to Long Segar residents either for cash or rice. During 26.5 hours observed in four of these stores,* customers bought the equivalent of Rp. 50,625 worth of goods. Kenyah store-owners also have ricefields which typically form the mainstay of their family's subsistence, and which provide supplementary income even to the most successful traders. One of the most entrepreneurial Kenyah store-owners is a widow who also owns (in collaboration with younger male relatives in her household) a small longboat, the generator that sells electricity, and one of the operating commercial rice hullers. Women generally, however, have a disadvantage in these commercial enterprises because they have less familiarity with the Indonesian language and less experience dealing with outsiders than do the males.

Kenyah involvement in shopkeeping is an excellent example of the kind of adaptability and responsiveness to changing circumstances that the MAB project hoped to document. Commercial activity is inconsistent with frequently expressed traditional Kenyah values on generosity and sharing, and it is inconsistent with observed behaviour in the Apo Kayan. Kenyah discomfort with the process of buying and selling is obvious. When tourists

*Four stores were chosen, situated in differing parts of the community. Observation periods were four hours, on varying days of the week, in both mornings and afternoons. Customers' age and sex were recorded as well as the item of purchase, the cost, and the mode of payment (i.e., rice or cash). Two non-Kenyah stores were similarly observed, but are not recorded here.

come in search of Kenyah handiwork (sunhats, baskets, knives, mats), the Kenyah are reluctant to name a price, unhappy with the price offered, uncomfortable with bargaining, and seldom leave such a transaction looking happy and satisfied regardless of the price ultimately paid.

Yet, at this point there are eight Kenyah stores in Long Segar; the headman regularly sells the elaborately carved knives he makes (for prices ranging from Rp 40,000 - Rp. 100,000); people collect and/or manufacture various products on an intermittent basis for sale to passing longboats. If an economic activity promises to be sufficiently profitable, Kenyah are usually willing to try it.

It is paradoxical that outsiders (government officials, tourists, foreign aid advisors) decry the obviously growing commercialism of the people of Long Segar at the same time that they complain about local traditionalism and reluctance to change. This is a strange, but pervasive, kind of blindness, built on a largely unsubstantiated belief that rural people are stubbornly traditional and institutionally resistant to change. Table III shows a few of the changes that the people of Long Segar have made over the past twenty years: Hardly a testament to the force of tradition!

Table III

RECENT CHANGES BY LONG SEGAR KENYAH

Sector	1960	1980
RELIGION	mostly animist	all Christian
HOUSING	longhouses	modified individual homes*
COMMERCE	none	plentiful
AGROFORESTRY	one inventory/seeds one balance/minor for. prod. secondary forest no cash crops clearing/ axe, knife	another inventory another balance primary forest some cash crops clearing/chainsaw
FOOD	no commercial preparations; rare purchased consumables hand hulled rice	some canned meat, fish, milk noodles, MSG; plentiful sugar coffee, tea, salt, tobacco machine hulled rice
TRANSPORTATION	walking, paddling, poling	<u>ces</u> , longboat
EDUCATION	widespread disapproval	near universal approval
MEDICINE	mostly traditional	mostly western
MALE ABSENCE	>one year -- common	rare
BIRTH CONTROL	abstinence/male absence	birth control pills
DIVORCE	common	rare

*One of the requirements laid down by Respen to receive housing benefits was adherence to a centrally-planned village layout, including single family housing. The Kenyah have complied with the requirements, formally; but about half of the homes contain more than one nuclear family, and several are essentially short longhouses. Several have also created architectural changes that retain the valued characteristics of longhouses at the same time that external appearances suggest the "modern" look Respen was probably striving for.

The sale of agroforestry produce typically includes the following: rice; garden produce (e.g., legumes, cabbage, amaranth, onions); occasional cash crops (pepper, coffee, cloves), fruits (oranges, coconuts, pineapples, soursop), and animal products (chickens, eggs, pigs); and forest products (ironwood shingles, boards and beams, rattan). The major buyers are the employees of the nearby timber companies, the plantation, and the longboats bound for Samarinda.

To date, sale of garden produce, cash crops, and fruits is not a regular, reliable source of income. In spring 1980, soybeans, peanuts, green beans, and cowpeas, were planted in the fields after the rice harvest to offset losses due to a three-week flood in December. Some people bought their own seeds; others received seeds from the Government. But marketing problems (related to perishability of produce and transportation difficulties) make such efforts less profitable than they could be. This particular land use would be less feasible in the Apo Kayan, because of a longer growing cycle required for rice in the colder climate and higher altitude. The rice harvest was completed in Long Segar at the end of March, whereas in Long Ampung people harvest until the end of May. Planting is begun in both areas around the middle of August.

Gardening activity among the Kenyah has traditionally been considered even more a female endeavour than rice cultivation*; though gardening has been an activity with minimal cultural elaboration of symbolic value. Indeed, gardening has declined in importance in Long Segar, competing unsuccessfully with the allocation of time to activities that can more reliably bring cash income like rice production or wage labor (see also Colfer 1981; Colfer, Soedjito and Azier 1980, for discussion of other

*This observation has been corroborated by a cognitive measurement technique called Galileo, the results of which will be reported elsewhere.

factors inhibiting gardening). The fact that extension efforts, training, seeds and other agricultural inputs are consistently provided to men rather than women may well contribute to the diminution of gardening activity as well---particularly considering the frequency of male absence from the village (time allocation data show that of the men aged 20-49, 23% were "away working", Colfer 1981b).

Experimentation with cash crops is currently underway, both privately and governmentally initiated, but the coffee, cloves, and pepper planted in the last few years have yet to produce much. Rubber, cocoa, cloves, coffee, oil palm, pepper, and coconut are all being tried at the nearby pilot plantation project; and the American timber company began clearing an area 30 km upriver for a planned rubber and cocoa plantation. Such plantations are conceived by the Government to be the best economic base for the 22,000 households of Javanese transmigrants scheduled to come to this area in the next few years (despite the widely acknowledged probability of grave ecological problems accompanying such a population influx). For development purposes, Soedjito (1980:2) recommends increased cultivation of oranges, legumes, soursop, coffee, and coconuts, all of which grow successfully in Long Segar; as well as encouragement of home industries, aquaculture, and tourism.

In contrast to gardening and cash cropping, the reliable agroforestry moneymakers in Long Segar are rice and timber, with rattan and shingle production providing a distant third. As discussed earlier, ricefields in Long Segar are increasing in size. Indeed, the size of Long Segar ricefields is a point of some disgruntlement from neighboring communities. The largest harvest from a single household in 1980 was about 1,000 kalengs, or 11,000 kilos of unhulled rice. Estimates by quantitatively oriented

villagers suggest that families use between two and three hundred kalengs (or 2200-3300 kilos) per year for subsistence needs (including non-foods).

Surplus rice is readily marketable. Longboats en route to Samarinda buy rice, as do the timber camps and the pilot plantation project. The American timber company requires six to seven tons of rice per month, which purchasing personnel prefer to buy locally as their workers consider local rice superior (Camp Manager, 6/7/80).

Lumber is sold to the longboats, or even brought directly by Long Segar residents to Samarinda. There is a welter of conflicting laws, rulings and customs related to the use of timber within timber concessions; but because of 1) the obvious discrepancy in wealth between the people and the companies, 2) the fuzziness of the law, and 3) a shortage of enforcement personnel, the people are essentially free to do as they choose in harvesting timber. The contracts between the Government and the timber companies specify that the people are free to utilize the forests in their "customary manner," including using trees for housebuilding. This right is sometimes used to justify timber harvesting for sale, on the theory that nails and other goods must be bought with money to finish a house. Clearly, the phrase "customary manner" is open to diverse interpretations in the changing circumstances that characterize East Kalimantan.

Men are drawn to this economic activity because of its profitability and the freedom to determine times of work. But only about ten men pursue this option repeatedly (and no one on a daily basis). Constraints that limit involvement in this activity include:

- . the strenuousness of the work,
- . availability of a chainsaw,

- . uncertainty about the legality of it* both on the part of the would-be cutter and the longboat owner who typically buys such products.
- . skill --- making straight boards and beams with a chainsaw requires real skill as well as strength.

On the other hand, its profitability is undeniable, when contrasted with rice production or typical wage labor (e.g., agricultural labor: Rp. 1,000-1,500/day; Pramuka: Rp. 20,000/month; experienced teacher: Rp. 27,000/month; head teacher: Rp. 56,000/month).

Kenyah disinterest in rattan collection and ironwood shingle making as economic activities is somewhat anomalous. Rattan collection is profitable in many parts of East Kalimantan, including the Long Segar area where Kutai people regularly collect rattan, make ironwood shingles, and sell both. However, Kenyah consider both activities to be alo' (non-Kenyah), and eschew them, except for personal use or in times of real scarcity.

On hearing that the American timber company had contracted to buy rattan for log raft construction from neighboring Long Noran (an Uma' Kulit Kenyah village) at a cost of Rp. 2.5 million/month, an uncharacteristic interest began to be expressed in Long Segar in rattan collection. This is another example of the pattern discussed earlier with regard to commerce. If something promises to be sufficiently profitable, people are willing to try it, even if it requires behaviour that they have traditionally avoided.

Wage labor opportunities, the second major moneymaking activity in Long Segar, are available at the pilot plantation project, the two foreign timber

*Legality also varies with species. The private sale of meranti in any form, without paying a royalty to the concession-holder, for instance, is clearly illegal. Ironwood is the species about which the most conflict and confusion exists, as it is not owned by the concession holder, it is considered an endangered/protected species, yet it holds a prominent place in traditional human timber use patterns in the area.

companies (.5 and 1 hour away respectively by ces) and with individual farmers at peak agricultural seasons. Additionally several entrepreneurial Kenyah seek contracts elsewhere to perform various tasks, recruiting their work teams from Long Segar. In June and July 1980, scores of men were involved in a contract to build a timber camp several hours upriver; in April 1980, perhaps a dozen men went up the Marah River to fell trees in what was erroneously understood to be a renewed governmental sanctioning of banjir kap.^{*} In recent years a group went to Balikpapan to build a road for the Transmigration Department; another group was organized to dredge and clean a river so that log rafts could be floated downstream. This pattern is a clear extension of the Kenyah tradition of male expeditions out of the Apo Kayan in search of salt and trade goods (see Vayda 1979:24-25; Peluso 1980, for a discussion of present-day Uma' Tukung Kenyah expeditions).

Pay rates, for daily labor at the American timber company start at Rp. 800/day; and general rates in the area are usually cited as between Rp. 1,000 and 1,500/day. Kinds of work typically done for these wages include weeding, harvesting, and clearing ricefields or plantation plots. No Long Segar residents are permanent employees at the American timber company. Kenyah reluctance to work there derives from wages that are too low to persuade them to leave home (where supplementary food is readily accessible) or to commute, and bad experiences with the sub-contracting company that managed the timber felling operations.

The American timber company personnel similarly expressed reluctance to hire Kenyah, citing their history of quitting when the agricultural cycle required their labor at home. Instead large numbers of Timorese, Bugis, and Kutai men

*Banjir kap is a method of harvesting trees that was outlawed in 1972 as environmentally damaging. Individuals cut down trees near the river's edge, felling them into or very near the water. The logs are then floated down the river whenever it rises sufficiently to carry them away.

are hired (bringing attendant problems with prostitution to the region*).

The economic activities outlined above represent a significant increase in the rate of forest cutting activity by the Kenyah over their traditional pattern. Not only are larger ricefields possible because of environmental and technological considerations, and desirable because of commercial considerations, but a variety of income generating opportunities exist that encourage further forest harvesting (either direct sale of lumber or sale of labor, most of which involves cutting down trees). Add to this the increasing activity of timber companies, and the increasing population in lowland areas (from natural increase, resettlement, and transmigration), and a situation exists that can spell disaster for the forests---and of course, in the long run, for the people who inhabit those forests.

In Kenyah history, the forests have quickly reclaimed all cleared land that was not constantly weeded. There appears never to have been any real land shortage, as attested to by the general desire for large population clusters among Apo Kayan people, the welcoming arms of neighboring villages near Long Segar, and the rarity of land disputes. To this point, there had never been any reason to be concerned about the regenerative capability of the forests. The problem was, rather, carving out enough clear land to plant a little rice. Current trends, as outlined above, suggest that the problem for the future will be protecting enough forest to maintain the delicate balance that is required for the maintenance of soil fertility, prevention of erosion, and a host of other tropical ecological consideration.

*The prostitutes in this area are usually migrants from East Java.

Just as the changes discussed in this section have potentially adverse impacts on the forest, so do dangers exist with regard to women and their roles in Kenyah life. As noted earlier, the traditional position of Kenyah women is seldom rivaled, globally. They have been economically independent; they have been able to lead autonomous, self-reliant lives; they have had important voices in economic decisionmaking; and they have generally had the respect and cooperation of Kenyah men. Their central role in rice production has already been discussed, as has the fact that rice production has been the core of the economic base among the Kenyah.

But the freeing of time from agricultural activity, combined with the increasing importance of money for daily life, is pushing the people toward engaging in alternatives to rice production in their concern to display industry and in their pursuit of more adequate subsistence. The impact of this set of variables on women is potentially deleterious. First, the additional free time mentioned above derives from the adoption of valued technological innovations (ces, rice-huller, and chainsaw). Two of these are not available, or as available, to women as to men, thus reducing their autonomy and the relative productivity of their work, as compared to men. Second, women have less access to alternative employment than do men; and therefore less access to money---money that is gaining an increasing importance, and already affecting the centrality of rice production to the economic base. Third, Kenyah involvement in interaction with outsiders increases as their involvement in a money economy increases, and that too has potentially negative impacts on women. Female knowledge of the Indonesian language is definitely inferior to that of males in general; female interaction with outsiders is characterized by tension because of differing customs pertaining to male-female relation-

ships; and female educational opportunities* have been limited compared to those of men so that the women are less confident when handling money than are men. Fourth, these factors that limit women's autonomy and value relative to men are operating within a context that includes a continuation of male absence. The men go away for wage labor, just as they went away on trading expeditions in the past. But now they are leaving the women to subsist within a money economy in which the women are disadvantaged. These "modernizing" influences in East Kalimantan, as in so many other places, will mark a step backward for Kenyah women, if current trends persist.

But here we are looking at the broader scene. We are trying to predict impacts on the forest and on women, in general and in the future. If instead we look briefly at the situation in Long Segar again, we find people content with what they are providing for themselves. Their lives are easier than they were in Long Ampung. No one has moved back to Long Ampung, nor expressed a desire to do so; and there appears to be unanimous satisfaction with the overall change in lifestyle. The people, by creatively availing themselves of opportunities in their new environment (just as they would opportunistically harvest fruit or bamboo shoots from a secondary forest they passed thru on their way to a ricefield), have both improved their current way of life and increased their destructive impact on their environment (both biotic and human). So what then can we say about the policy issues we hoped to address in this analysis?

On Policy Implications

Looking first at Resettlement policy, the irony is that an anticipated

*These educational opportunities have been provided by outsiders who generally considered male education to be more important.

bonus from the Government Resettlement Program was to have been a decrease in shifting cultivation, as a conservation measure. Wet rice cultivation, or sawah, as in Java, was to provide the alternative subsistence mode. Consistent with this plan, since 1972, the Long Segar Kenyah have been consistently encouraged to switch from dry to wet rice (sawah) farming by Respen personnel. Their failure to do so provides an excellent example of what Helleiner has labeled "wise rejection" (1975).

Sawah came to Long Ampung in 1957, when a man returned from a several year stay down the Mahakam River with the necessary knowledge and seeds. He planted sawah in a usually marshy area where the topography allowed him to control the water flow into and out of the fields. His success persuaded others to follow suit, and in 1964, for example, 35% of the household reported having some sawah planted in these marshy areas. People in Long Segar say yields are higher with sawah and they can have permanent fields, thereby avoiding the danger and hard work of clearing and felling every year. They also maintain there is less weeding.

But despite the agreement between Respen and local inhabitants about the desirability of sawah, there is only one small and very unsuccessful sawah plot across the Telen River from the village. And for very good reasons:

- 1) The topography does not allow the easy regulation of water flow that was possible in the Apo Kayan. If the water pumps that were promised by the Government had been provided, water could be supplied when needed (assuming a regular supply of fuel to run the pumps); but the fact that all the lowlying areas near the rivers are subject to periodic but unpredictable flooding is

a more serious difficulty.* Neither the resources nor the knowledge necessary to construct elaborate irrigation apparatus have been available.

2) As noted earlier, the soil in the area is typically fragile and infertile, succumbing to Imperata cylindrica (alang alang) when cultivated for three successive years (including the areas where sawah was planted). Fertilizer might alleviate this problem, but bring their own share of trouble considering the ever-increasing cost, erratic supply channels, and loss with runoff due to the force of tropical rains.

Without some additional and expensive inputs, sawah does not appear to be a viable alternative to the agroforestry system currently practiced in the area. Indeed, some question its viability at any point in time (though encouraging possibilities are being generated thru CRIA/IRRI's cropping systems research in South Sumatra and West Java).

As noted earlier, the quality of life for the people of Long Segar has improved in an overall sense (congruent with Respen's objectives), at the same time that their impacts on their environment have grown increasingly destructive. A greater emphasis on local-level planning and decisionmaking, a decentralization of development efforts could do much to avoid the wasted effort that frequently results from centrally planned policies (like the attempt to encourage sawah where ---and when---it was not feasible; or the attempt to convert people's housing style to single family dwellings). And the creativity and energy of the Indonesian people can be tapped to a much greater degree. Rural people know their needs; extension workers can be informed about national needs (e.g., conservation); and together effective

*In December 1979, many fields were ruined (36% of the households had at least one field ruined by flooding), being inundated for 3 successive weeks. See LEAP 1980, for a discussion of potential agricultural problems associated with rainfall and flooding in a comparable area 30 km upriver from Long Segar.

solutions can be forged. The new farming systems research and development approach (CID. 1980; McIntosh 1980) may provide a effective mechanism for pursuing this.

In determining the appropriate rights and responsibilities of timber companies, current uses of the forests by indigenous populations must be attended to. The fact that the Kenyah lives are intimately intertwined with the forest cannot be denied, nor can their dependence on it. Indeed, the same questions must be addressed when we look at the question of Transmigration in the area. Both timber companies and transmigrants represent an influx of potential users who are or will be competing for what are increasingly scarce resources (the forest and the land).

The issue is a complex one, because it is clear that the land and the forest cannot long support the kinds of human activity currently anticipated. Transmigrants in many other parts of East Kalimantan have had to resort to shifting cultivation, following local patterns, because of the infertility of the land (with disastrous infestations of *Imperata cylindrica* resulting); there is no reason to suspect otherwise in the Telen River region. Nor is there space for all the expected transmigrant families to support themselves by means of the quite extensive shifting cultivation methods utilized by the Kenyah---particularly located in the midst of timber concessions, bent as they are on one goal: timber removal.

Traditional land use rights of indigenous peoples are expressly protected by the Indonesian Government. Recognition of traditional land use rights must consider the fact that these systems are agroforestry---not simply agricultural---systems. Those "fallow" fields are in actuality areas where products other than rice are harvested. A recent Transmigration planning document (IEAP 1980), for instance, notes that only 5-10% of the land along

the major rivers in the Telen River area is cultivated at one time. From this, they conclude that "...present land uses are not considered a significant constraint on land planning for [transmigrant] settlements." (Ibid:26) Recognition of Kenyah economic practices as part of an agroforestry system requires alteration of this conclusion. Indeed, if the 10 year regeneration cycle used by the Long Segar Kenyah for their own fields is adhered to, that land use figure would go up to 50-100% of the land along the major rivers in use at any one time.

Obviously alternatives to this extensive land use must be devised (unless some creative--and improbable--solution to Indonesia's population problem can be devised). The Indonesian government recognizes its needs for revenues from the timber concessions; its needs to conserve the forests at least to the extent that they are necessary for preserving the fertility and utility of the land; and its needs to plan for a better quality of life for its people.

One possible partial solution to the conflicts inherent in these needs is harnessing the resources and cooperation of the timber companies in development and conservation efforts. Indeed, this is already part of the formal requirements written into the contracts between the Government and the timber companies; but these requirements are inadequately enforced. Timber companies are still free to concentrate all their efforts on what they call "production" (extraction). If comparisons are made between the costs of timber production in 1978, for instance, and the costs in 1980 (remembering the devaluation of the rupiah), set against the price of timber during those periods, the phenomenal profits that derive from timber operations become clear. Indonesia needs to protect its rights both to a greater emphasis on conservation and silviculture and to a significant share of timber profits for the people, as advocated by Vice President Adam Malik (1978).

With regard to Transmigration, greater care needs to be taken that the transmigrants actually have access to the infrastructure and support services planned for them. Some of the worst environmental consequences of transmigration have derived from inadequate governmental preparation and follow-up at transmigration sites. The plantations planned at the Maura Wahau site on the Telen River have potential as viable alternatives to the Kenyah's extensive agroforestry system; but not following through on critical parts of the plan is a proven route to disaster (both environmental and human).

In addressing the "fourth dimension", or the status of women, planned efforts need to be undertaken to orient extension workers, bureaucrats and planners toward providing services, information, and inputs to women. Women need to be trained, women need to be involved in agricultural projects, women need the same educational opportunities as men do. The deleterious effects of development projects on women have been documented all over the world, including on Java (Collier and Soentoro 1978), and Indonesia, like other nations, needs to address this problem. The "development community" has begun to accept the inadequacy of the "trickle down" theory to Third world development; and it is now becoming necessary to accept the fact that benefits do not even "trickle down" within the household. Increases in men's earning power do not automatically improve the quality of life for their families; technological innovations can have unanticipated negative impacts on the very people they were hoped to help.

Women have been "invisible" (Blumberg 1979) for too long. National statistics and research in general have failed to provide policymakers with the necessary information to plan effectively for the female half of the population. Yet a continued failure to address these issues prevents us from optimizing the returns on our development investments.

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