UNIVERSITY OF EAST ANGLIA

School of Development Studies

THE IMPORTANCE OF NON-TIMBER FOREST PRODUCTS TO LIVELIHOODS AND CONSERVATION IN THE SEBANGAU CATCHMENT, CENTRAL KALIMANTAN, INDONESIA

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ABSTRACT

The Sebangau River Catchment, Central Kalimantan, holds an area of tropical peatswamp forest that is of international, regional and local importance. However, its existence is threatened by a number of socio-economic and environmental pressures. In order to conserve tropical rainforests the potential of Non-Timber Forest Products (NTFPs) has been debated internationally for integrating conservation and development. In the study area NTFPs are vital for diversified livelihoods: for subsistence, income and as a buffer when additional security is needed. The diversity of NTFPs, varying on spectrums of sustainability, seasonal availability and market stability, could curtail the potential use of the products in conservation and development. Therefore, these limitations must be acknowledged through provision of a flexible management strategy with adequate monitoring and sanctioning of compliance and fundamentally a community that wishes to continue using NTFPs.

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CHAPTER 1: INTRODUCTION

During the last 30 years, 418 hectares of natural forest have been lost globally (UNEP in Lee 2002). In Indonesia concessionary and illegal logging, extensive forest fires, land conversion for agriculture and plantations, and encroachment have culminated in the loss of 1.6 million hectares/year over the past 10 years (Ministry of Forestry 2001). Crucial ecological services are provided by tropical rainforests (in hydrology and carbon sequestration), their loss and the loss of these services affects society from local to international levels. Indeed the conservation of biological diversity is vital to the sustainability of many sectors including forestry, agriculture, fisheries, healthcare, science, tourism and industry (MacKinnon 1998). International concern over the loss of biological diversity and the direct and indirect services it provides culminated in the signing of the Convention on Biological Diversity following the United Nations Conference on Environment and Development in Rio de Janeiro, 1992. This advocated the protection of natural biological capital and alleviation of poverty in a sustainable way (Primack 1995). Biodiversity is 'the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems' (UNEP 1994: 8). Continued efforts to address these issues were reiterated at Rio +10, the 2002 World Summit on Sustainable Development in Johannesburg (Lee 2002).

Theories on the underlying causes of deforestation are numerous; Malthusian population pressures, links between poverty and environmental degradation, government and market failures, Hardin's 'Tragedy of the Commons' (Soeharto *et al* 2001). However, all are related to the pressures that humanity exerts on the environment in the search for a livelihood[1]. Popularised by the 1987 Brundtland Report and central to present conservation and development projects, the term 'sustainable development' became the objective. There is confusion over its definition leading to fears that 'the concept of sustainable development is in danger of becoming a "landfill site" for every environmental idea' (Dore *et al* 1994: 491). Generally it 'embraces environmental, social and economic components, the former requiring that productivity, adaptability and capability for renewal are maintained' (Soeharto *et al* 2001: 29). Its relevance grew following a number of failures in the 'fences and fines' approach to conservation which denied local communities access to protected areas (Barrett *et al* 1995). Infeasibilities in designating large areas for protection have led to the popularisation of multiple use areas in the wider matrix of agriculture, marine resource use and forestry to conserve habitats and wildlife whilst providing local communities with a continued source of revenue. Strategies now aim to integrate conservation and sustainable development. Highlighted in the World Conservation Union's (IUCN) World Conservation Strategy, the UNESCO Man and Biosphere Programmes and more recently Integrated Conservation and Development Projects (IDCP's), however their universal success is questionable (Barrett *et al* 1995). Since the 1990s, there has been debate around the contribution of Non-Timber Forest Products (NTFPs) promising economic benefit from an intact forest cover

[1] Livelihood refers to 'a level of wealth and stocks and flows of food and cash which provide for physical and social well being (Chambers 1993 in Brown *et al* 2000).

(Coomes 1995, Arnold *et al* 2001). Tropical forest resources fall into two groups, timber and Non-Timber Forest Products, the latter consisting of fruit, oils, latex, fibres and medicines (Peters 1989). A proliferation of research and funding have targeted this issue following Peters (1989) influential study and considering the magnitude of people reliant on NTFPs[2]. Researchers are divided; initially there were advocates (e.g. Balick and Mendelsohn 1992) and opponents (e.g. Browder 1990) to the potential of NTFPs for forest conservation. Currently a more nuanced perspective rises above mere promotion or criticism of NTFPs in this role indicating some forest types, social organisation or products may be beneficial to raise rural incomes and protect forest habitat; therefore site-specific study is required (Godoy 1993, Brown *et al* 2000, Shanley *et al* 2002). Indeed as forest product use varies substantially it is difficult to extrapolate from case studies. Valuations, such as Peters (1989), can go out of date quickly thus the qualitative relationship between forest users and their resources is more illustrative of the role of NTFPs in a diversified livelihood (Byron *et al* 1999). In addition, other vital livelihood activities, such as fishing, hunting, farming and sustainable timber extraction, have frequently been omitted from studies, yet they are reliant on forest systems (Brown *et al* 2000). Therefore, fishing and hunting will accompany other NTFPs in this study and livelihood links with farming and timber will be highlighted.

Deforestation, livelihood and conservation issues are relevant to the case study area of the Sebangau Catchment, Central Kalimantan, Indonesian Borneo. The World Wildlife Fund (WWF) is in the embryonic stage of devising a community-based ICDP for a 1.5 million-hectare region in the Sebangau (WWF 2001). It is not yet known what form this will take. In order to limit the possibility of inappropriate strategies 'appropriate knowledge of current use and potential economic value of natural forest products is urgently required to assess local level consequences of land use planning and development efforts that will affect forest environments' (Gram *et al* 2001). Considering the importance to many diversified livelihoods of NTFPs for subsistence and economic needs it is possible this could be a conservation measure in itself. Therefore this research paper will firstly determine the importance of NTFPs to local communities. Secondly it will examine the potential of promoting NTFPs as a conservation strategy in the area. The first section will provide theoretical context. Strategies for both conservation and development evolve over time and situation; they are constantly reworked. This development promotes continued efforts to improve on existing research; this can only be done by heeding existing concerns (and will be accounted for in this study). The regional background presents geographical and historical factors that affect current forest use, thus preventing the provision of a static image of NTFP collection. Many studies have overlooked the influence that geography and history (both in existing policy and people's institutional experience and thus trust) can have on conservation projects (Coomes 1995). Quantitative and qualitative data was collated; these are discussed in the methodology. The results and discussion build evidence from the case study. Firstly, highlighting the role of NTFPs in diversified livelihoods, although frequently a secondary occupation, it is an important buffer in slow times of the year. Secondly, the opportunities and constraints to relying on NTFPs for conservation will be discussed in light of existing research.

[2] South East Asia alone, the livelihoods of 29 million forest dwellers rely on NTFPs (Prance 1998).

CHAPTER 2: THE DEBATE: EXISTING STUDIES ON NTFPS

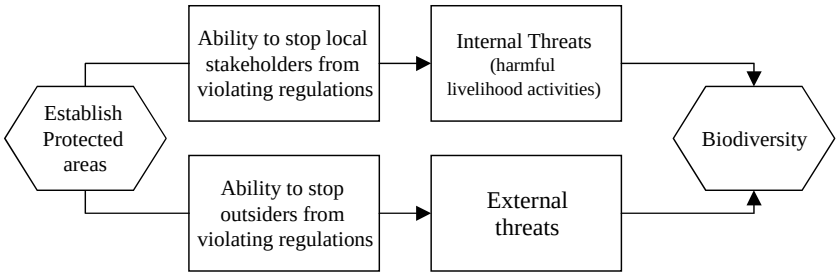
The analysis of literature and current debate surrounding the conservation and development potential of NTFPs highlights many issues pertinent to this study beyond merely the provision of context. By identifying past constraints and omissions, similar mistakes can be mitigated. These will be emphasised in this section. Firstly, however, NTFPs must be grounded in the wider context of conservation initiatives, indicating reasons for their initial enthusiasm. Salafsky and Wollenberg (2000) summarise the linkages between livelihoods and conservation (see figure 1). Protected areas (with no link between conservation and livelihoods) were common until the 1970s; plagued by social and economic limitations (weak management, inadequate resources) a search for alternatives began (figure 1a). Modifications led to a core protected area and a buffer zone (as in UNESCO Biosphere reserves) decreasing reliance on biodiversity and substituting other livelihood activities, such as plantations. However, its indirect linkage has led to problems including continued use of prohibited areas and encroachment from successful rural development initiatives in the buffer zone, damaging the habitat it aimed to conserve (figure 1b). During the 1990s recognition of many local people's economic reliance on biodiversity and the incentive this created for individuals to protect the area from external threats, thus reducing costs of protective regulations, fostered the development of directly linked strategies (figure 1c), balancing conservation with development. It is this latter area that NTFPs are found and discussions over potential contributions continue.

Peters (1989) study in Mishana, Peru, concluded that 'sustainable exploitation of non-wood forest resources represents the most immediate and profitable method for integrating use and conservation' (Peters 1989: 656). Likewise Balick and Mendelsohn's (1992) study of medicinal plants in Belize, generated forest values for harvesting that compared favourably with other land uses. However, initial hopes among funders, researchers and environmentalists, that NTFPs would be the 'panacea' for rainforest conservation and development have been tempered and a more complex and context specific relationship has developed. Peters has been criticised for ignoring harvesting methods where palms are killed to collect fruit (Bodmer 1990). Economically, Southgate (1996) suggests that extractors realise few of the revenues from NTFPs themselves, instead benefits accrue at the top of a chain of middlemen. Others criticise Peters for suggesting long-term unrealistic, hypothetical calculations that dismiss the harvesters penchant for maximising short-term returns, this in turn relates to land tenure (Phillips 1993). Balick and Mendelsohn's discussion assumes absolute ownership of land making long-term investment more fruitful, however under common property (user's are a specified group) or open access (all can use) there is incentive to take as much as possible immediately (Tremaine 1993, Hodson *et al* 1995, Abraham *et al* 2001).

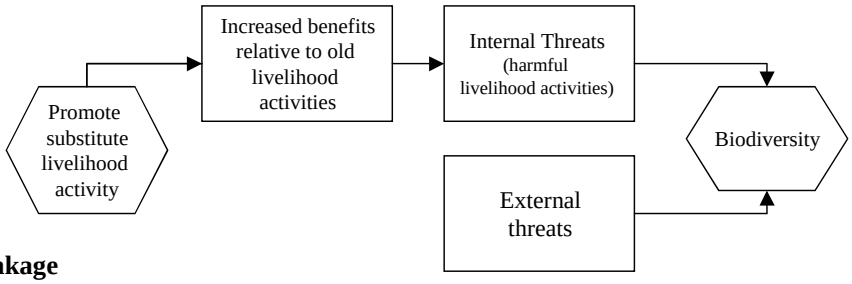
These criticisms do not dismiss wholesale the contribution of NTFPs, they simply highlight the diverse factors that one must consider during research; land tenure, market access, product type, alternative income opportunities. For example Shanley (2002) suggests forest management for local trade may be more beneficial than aiming for unstable distant export markets. Southgate (1996) suggests strengthening markets for NTFPs could raise incomes and sustainable use but not protect large areas of forest. It is therefore difficult to generalise as only as small segment of variation between cases is

documented and the majority of this in Amazonia (Nepstad 1992). Although it is impossible to address all aspects of this multidimensional structure in this study it is possible to include and consider the complexities to prevent arriving at simplified conclusions that do not account for the diverse influential factors concerning NTFP use in conservation.

a) No Linkage



b) Indirect Linkage



c) Direct Linkage

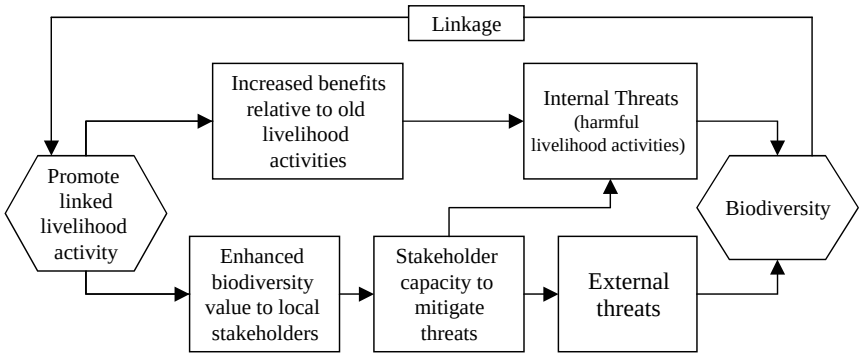


Figure 1:Models of linkages in conservation strategies (hexagons indicate interventions, rectangles are the conditions of the research site) (Salafsky and Wollenberg, 2000: 1426).

CHAPTER 3: REGIONAL BACKGROUND

3.1 Geography and environment

15 000km of peatswamp exists in the floodplains between two rivers, the Katinghan and Kahayan in Central Kalimantan. Within this flows the black-water Sebangau river (see figure 2). These tropical peatswamp forests[3] (60% of which are in Indonesia) transform CO^2 and accumulate ten times more carbon than any other natural vegetation (Bellamy 1997). In addition it forms the largest lowland refuge remaining for a significant population (>5000 individuals) of endangered orang-utan (*Pongo pygmaeus*) and other mega-fauna. Of regional concern the Sebangau Catchment recycles freshwater into the atmosphere maintaining rain during the dry season in Kalimantan's interior foothills, and acting as a buffer to saline water intrusion from the sea (Rieley *et al* 1997). Locally, the forests are an important breeding ground for fish and provide a source of subsistence and income for villagers living in the area (CIMTROP 1999).

Despite these benefits the area is threatened by logging, forest fires and land use change to palm oil plantations and for agriculture. In the 1997 forest fires 1.7 billion tonnes of carbon, that is one-third of global emissions from fossil fuels for that year, were released from Borneon peat bogs. Research indicates a positive feedback between logging and fire occurrence. There is concern that destruction from the fires since mid-July in 2002, another El Niño year, will reach the magnitude of the 1997 fires in Indonesia (New Scientist 2002, Siegert *et* al 2002). Fires can rapidly spread out of control whilst clearing land for agriculture. Clearance persists despite these floodplains being nutritionally poor and toxic creating acid sulphate soils on exposure. Without expensive draining, liming and intensive fertiliser use, this area has limited potential for agriculture emphasising the importance of the forest resources and NTFPs, and explaining widespread interest among scientists and environmentalists in conserving the area (Yonebayashi *et al* 1997).

3.2 Social and political situation

The inhospitable nature of the Sebangau Catchment has meant few people have inhabited the third largest province in Indonesia, Central Kalimantan (Saman and Limin 1999). Pre-1970 scattered populations of indigenous Dayaks (9 people/km^2) used the forest, however, during the 1970s a number of government transmigration programmes were initiated to relieve population pressure on the outer Indonesian islands, now 1.4 million people, both local and migrant, live along the rivers and tributaries (the main transport arteries) seeking an income primarily from the forest (CIMTROP 1999). This has not been without tension. Local communities harvesting rattan, tapping rubber and fishing previously had sufficient resources for their needs. However, loss of land and income contributed to the ethnic slaughter of over 100 people in 2001, mostly Madurese by local Dayaks, in Sampit, Southern, Central Kalimantan. In fear the majority of Madurese in the capital Palangkaraya have returned to Madura, yet the problem of gaining a living from diminishing resources remains (Muhamad *et al* 2001).

[3] Annually the Sebangau Catchment adds a further 750 000 tonnes of carbon to its existing 10 billion tonnes.

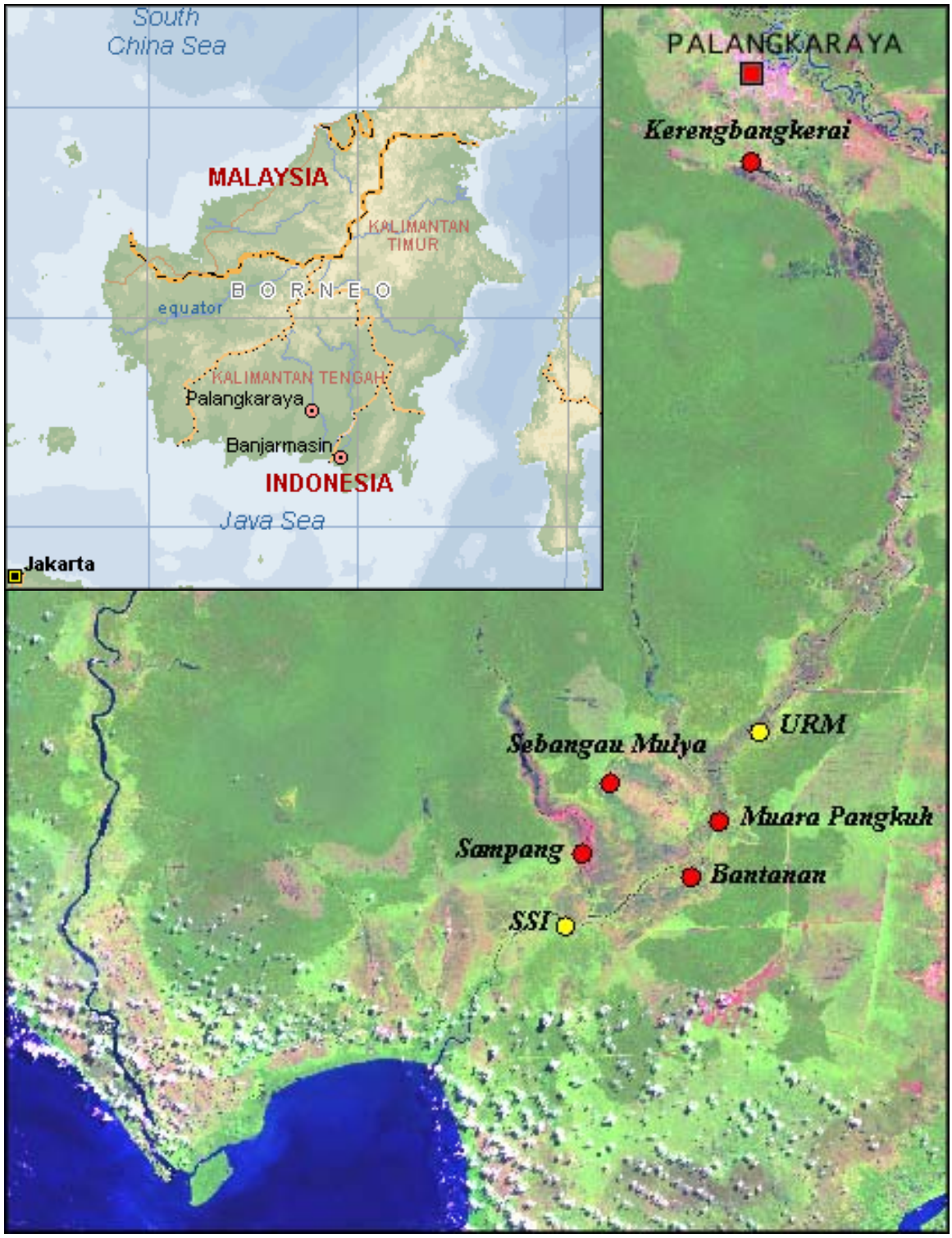


Figure 2: Map of Borneo and the Sebangau River study sites (Source: former, Expedia 2003 and latter, GIS map from GPS readings taken at the time)

Tensions among the case study villagers were primarily against 'outsiders' (from Banjamasin and Bauhaur, South Kalimantan) using resources, not those in the locality. Table 1 below shows the history, ethnic mix and livelihoods of the five main villages surveyed. Sebangau Mulya is solely transmigrant; the transmigrant villages were placed in more fertile areas and the government initially provided lime, making agriculture possible but still risky. Sampang, Bantanan and Muara Pangkuh derive most of their income from fishing and logging. Kerengbangkirai is an exception; it is the main port that products pass through to the capital. Table 2 provides population information; the health and education indicators also highlight Kerengbangkirai through its greater array of facilities. The others have limited health and education provisions perpetuating low employment potential beyond the present occupations.

Table 1: Settlement history and employment

PLACE	VILLAGE HISTORY AND ETHNICICTY	MAIN LIVELIHOODS*
KERENG – BANGKIRAI	30 Original families, 70 families joined in a 1972 transmigration programme mostly from Central Kalimantan. Main port through which forest products pass.	1. Farmers (59%) + 2. Fishing 3. Logging + 4. Jelatong 5. Government
SEBANGAU MULYA	1988 - 2 major transmigration programmes brought occupants from west, east and central Java, Lombok, Bali and Timor	1. Farming (98%) 2. Logging 3. Gemur 4. Government workers (2%)
SAMPANG	10 Original families settled in 1955 from local areas for good fishing. 1985 influx from east Java and South Kalimantan as the first saw-mill opened. Wet season outsiders come (about 1000 extra)	1. Logging 2. Fishing No farming - not suitable land (wet season too wet, dry season too dry).
MUARA PANGKOH	Established 1992, local Dayaks and people from Banjermasin. Since 2002 bandsaws closing. Many people left as shown in table 1 - newcomers returned to hometowns and locals moved to find new incomes.	1. Logging 2. Fishing 3. Gemur 4. Trading No farming - not suitable
BANTANAN	Pre 1980 - only a couple of villagers. Influx for logging. Greater number of local Dayak to outsiders but still a mixed community with those from South and central Kalimantan in addition to Java. Wet season - outsiders come to collect logs and live in forest (about 3000 extra)	1. Fishing (100%) 2. Logging (about 70 people) 3. Farming (8 families)

*Main occupation is shown first for 2002.

+ For all the villagers the occupation title in official documents of 'farmer' or 'logger' does not exempt them from using NTFPs.

Source: Village Head interviews 2002.

Table 2: Table showing demographic information for 2002 of the five main villages.

PLACE	POPUL.	FAMILIES	RELIGION (%)	HEALTH	EDUCATION
KERENG – BANGKIRAI	5519	1511	MUSLIM 74 CHRISTIAN 24 HINDU 1 CATHOLIC <1 BUDDHIST <1	*Clinics:* GOVT. 1 CHILDRENS 4 *Staff:* NURSES 2 MIDWIFE 2 TRAD. MIDWIFE 3	KINDERGARTEN 2 ELEMENTARY 5 JUNIOR 1 JUNIOR ISLAMIC 1 SENIOR ISLAMIC 1 Teachers 95 in total, but many work in the capital.
SEBANGAU MULYA	1324	352	MUSLIM 99 CHRISTIAN <1 HINDU <1	CLINICS 1 STAFF 0 Inactive, no staff. Nearest clinic is SP1, staff visit once a month.	ELEMENTARY 2 Use senior Islamic school in SP1 if wish for further education
SAMPANG	650	87	MUSLIM 100	CLINICS 0 TRAD. SHAMAN 1 Acts as midwife. Use Bantanan if ill.	SCHOOLS 0 90% of school age do not attend school. The 10% who do stay with relatives in Bauhur and SP1
MUARA PANGKOH	150 (2000-700)	30 (2000-120)	MUSLIM 100	CLINICS 1 STAFF 0 For 3 years - no staff and no money. Use SP1	ELEMENTARY 1 STAFF 0 Were 2 teachers, 1 came 2 weeks every month. 1 on contract from SP1, since July none.
BANTANAN	125	36	MUSLIM 95 CHRISTIAN 5	CLINIC 1 *Staff:* GOVT. PAID NURSE 1 UNTRAINED MIDWIFE 1 If sick go to SP1	ELEMENTARY 1 Only 3% attendance. For Junior high, can use SP1.

Displayed according to population size, starting with the greatest.

Source: Village heads 2002

3.3 Government policies

The Indonesian Government policies have contributed to much of the present forest degradation. Firstly, through ill-founded projects such as the Mega-Rice Project[4], secondly, through its outlook on natural resources. Forest products have been heralded as the key to national economic development and legal concessions[5] have been granted since the 1970s, but without efforts to reward or penalise behaviour 35% of Indonesia's tropical forests have been exploited without reforestation attempts. In addition, illegal logging is rife and legal licences under 'Forests for the People' (regulation 677/1998) have opened these areas to outsiders as local people have been unable to organise effectively to get concessions (Saman and Dohong 1999). However, in the area under consideration many timber concessions finished in 1997 followed by illegal logging, which adheres to no guidelines on location or size of timber (Husson *et al* 2001).

In Kalimantan, under the centralised authoritarian government of Suharto, timber was taken with little revenue accruing to the province. However following his demise the new government in 1999 committed itself to 'reform and eradication of corruption, collusion and nepotism within government' (Muhamad *et al* 2001: 157) and moved for decentralisation. This has, however, increased opportunities at regional level for continued corruption as previously unseen wealth is now available providing little incentive for authorities to halt illegal activity which threatens both the sustainability of livelihoods and the environment. Nevertheless, it is this decentralisation that has opened opportunities for new conservation and development strategies such as a community-based ICDP to be considered (WWF 2001)

These background details highlight the need for conservation within the region juxtaposed against the complex social, political and economic forces that complicate it. Reiterating the need to find how people utilise the forest so conservation efforts do not alienate local needs whilst endeavouring to protect against more powerful forces.

[4] In 1995 a 1million ha rice project was initiated, the area was drained for settlement and irrigation. It was expected to provide 5 million tonnes of rice to 200 000 households. Although scientists thought this unfeasible on the poor soils, the political climate at the time did not allow this to be voiced. The project came to an end after the disturbed, dry area became vulnerable to the 1997 forest fires (Muhamad *et al* 2001).

[5] The new government is more sympathetic to maintaining the forest. The MoF stated in 2002 that all concessionaires failing to manage their area sustainability (no cutting of trees <50cm diameter, or outside area) would have their licences revoked; inspections commencing in January 2003. It is feared that this will further encourage illegal activity; many factories currently rely on illegal sources at present and demands must be met to maintain jobs (Witular 2002)

CHAPTER 4: METHODOLOGY

Research was conducted to ascertain the contribution of NTFPs to the livelihoods of local communities along the Sebangau River. Semi-structured interviews were carried out with key informants from the WWF and the government forestry department to ascertain potential conservation proposals that may affect the communities forest usage. Interviews with village heads provided demographic and village specific information (shown previously in Tables 1 and 2). Here information showed NTFP use in the majority of livelihood strategies making random sampling of NTFP users more accessible. This ensures that the resource's importance is not overestimated and assumed to be relevant to all villagers, some of whom do not directly rely on the collection or marketing of products.

Extensive questionnaires (n=44), lasting at least one hour each, were conducted between 1st August and 7th September 2002. These were used to gain nominal and ordinal category data, open ended discursive questions and continuous quantity data for both qualitative and quantitative analysis (appendix 1 and 2). Information was collected regarding the extent of extraction, harvesting methods, monetary value, contribution to income and seasonal activities. Market based surveys were executed in the capital, Palangkaraya as many products collected arrive here for sale. Informal interviews in gemor, jelatong and rattan warehouses provide further insight than can be provided by smaller vendors. Direct observation of umbut and jelatong collectors and a 12 hour night with bat collectors in their forest sites was executed.

4.1 Data Analysis

To determine the role of NTFPs to the livelihoods of local communities, it is imperative to know the scale of individuals collecting or selling products from the Sebangau catchment. Village documents provide economic information. It is difficult to ascertain the exact figures involved without extensive questioning with all individuals for subsistence and economic needs; therefore each collector was asked the number of other collectors known in the village. The results of this provide basis for the following set of results which provide information on the suitability of NTFPs to conservation and development this will be analysed in four parts seasonality, sustainability, markets and the use of middlemen, and land tenure.

4.2 Bias

Every endeavour has been made to reduce bias, in questionnaire design, survey technique and interpretation of results. However restrictions of time and access to information were evident. Five villages were chosen and deemed most representative of forest use within accessible distance from both camp and each other, considering time and cost; fortuitously these settlements are clustered in close proximity and situated on the riverbanks near the forest edge. Kerengbangkirai is the main port through which products pass from the Sebangau River, the others represent transmigrant and local settlements and were selected to gain a broad spectrum of information on different products. Research in the dry season offered both opportunities and constraints. As the slower season, more people were available for interview, although activity still persists,

there is less dispersion of individuals into the forest on trips that could take up to a month. However, it did mean that the extent of some seasonal operations (such as bat collecting) could not be directly observed and results for present costs could feasibly differ if interviewed in the wet season, although efforts were made to gain information on both seasons. By staying in the villages and working early morning until late evening it was possible to interview those, such as fishermen, who work during the day, in addition to visiting collection sites within the forest. Where possible women were interviewed, however few were involved in the actual collection of larger products such as gemur and jelatong.

4.3 Discussion of research methods

Questionnaires have restrictions on the type of information gathered (Robson 2002), nevertheless, for this research the methods employed were considered more appropriate than other methods such as the currently popular participatory tools of Participatory Rural Appraisal (PRA)[6]. In this survey, although valuing local knowledge and expertise on local issues, it had to be clear that in return for people's assistance, their expectations must not be raised by discussing needs, hopes and identifying local problems, as I would be unable to fulfil them. A problem frequently encountered in the empowerment goal of PRA. In addition, time restrictions prevent an in depth knowledge of social and political dynamics which affect results (Guijit *et al* 1995, Allison 2002). However, some visual diagramming, one 'tool' of PRA was used to triangulate the results, establish omissions and clarify the other research methods.

[6] '..A growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, to plan and to act' (Chambers 1994: 953). Although successfully implemented in a number of projects since the mid 1980's, its growth in popularity has led to universal and indiscriminate use and thus requires caution in its conduct (Guijit *et al* 1995).

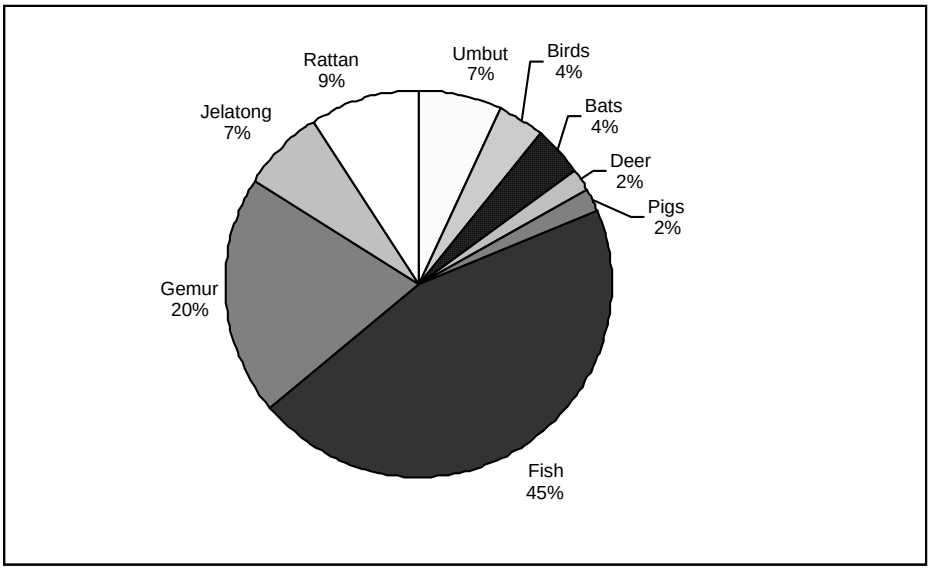
CHAPTER 5: RESULTS

5.1: Details of the sample and NTFPs used

Two-thirds of respondents were male (n=29) and one-third female (n=15). This imbalance is explained by the prevalence of men in collecting certain goods (i.e. gemur, jelatong and bats). However, 40% of women collectors[7] used the products for securing 'daily needs' (sugar, tea, food). Amongst market sellers[8] only, women were more prevalent (71% of sellers were female). Within gender groups, 33% of all women, and only 7% of all men sell the goods collected; this was found to be significant using the Pearson's chi-squared test (P=0.01). The distribution of ages was similar for both, the mean, mode and median for women was 38, 40 and 40 years respectively ranging between 20 and 57 year old. For men this was 39, 30 and 39 years ranging from 17 to 64 years old.

A number of NTFPs are taken from the peatswamp forests in the Sebangau catchment, these are shown in table 3. Information on fruit and medicinal plants are not included in this study for the former, its usage was not widely verified, however one respondent suggested that from January to May fruit in the forest was available for 'local eating'. Whilst exiting Sampang by boat a local woman pointed to grapefruit–like fruits along the waters edge apparently used by most women in the village for washing their hair. For medicines, although people were known to use forest plants, it was not possible to follow this up. The proportion of the NTFPs appearing as the most important by all respondents is shown in figure 3 below.

Figure 3: Chart showing the percentage of NTFPs collected by those surveyed (compiled using data on the main NTFP used by each individual)



[7] 'Collectors' refers only to those entering the forest or along rivers extracting the product. They are resident in the villages.
[8] 'Sellers' refers to those within the villages and Palangkaraya who only sell the product (it does not include those collectors who also sell.

Table 3: NTFPs harvested and their uses

NTFP	Latin or local name	Use
Gemur bark	(*Alseodaphne* spp.)	Mosquito coils, as a surfactant for recycling engine oil and in some make-up products
Jelatong	(*Dyera* spp.)	Latex used to make coverings for electric and telephone cables, but mostly exported to Japan for use in the manufacturing of bubblegum
Rattan	(*Calamus* spp.)	Climbing spiny palm used locally to make mats, baskets, and fishing traps but exported for the furniture trade. Jelatong collectors also use a small amount to support the bags used for tapping trees
Fish	Twelve species of fish named. These are *Barung, Gabus (Behau), Kakapar, Karandang, Lele, Mehau, Papuyuh, Pentet, Saluang, Sapat (Sasapat), Tahuman and Tapah (Tamphas)*	Fish provides the main source of protein; Kalimantan has higher fish consumption than any other part of Indonesia (40kg/head/1998) (Saman and Limin 1999)
Bats	CITES listed (domestic use is legally permitted) Large Flying Fox/Fruit Bat (*Pteropus vampyrus)*	Only one species used for food. Its heart is also eaten raw as a popular medicine for asthma; one seller thought the adverse effects of smoke from forest fires descending on Palangkaraya since mid July meant customers were requesting bats more for medicine than meat
Wild pigs/ Deer	(*Sus barbatus*), (deer - primarily *Cervus unicolor*)	Hunted for food
Birds	Blue-crowned hanging parrots (*Loriculus galgulus*) and Hill Minahs (*Gracula religiosa*) are known to be taken from the Sebangau	Hang in cages outside almost every house in every village. Sellers in the capital stated they also sold farmed birds from Java
Umbut	Umbut	Young pith of rattan from the growing shoot, is popular in Dayak recipes
Purun grass		Used to make mats
Terrapins	*Kura kura: Tangkup, Simpur* and *Ringgit*	Caught in fishing traps and sold to traders collecting for the pet trade in Hong Kong[9]

[9] Only two catchers were found; both still catch them unintentionally but last year sold to buyers for export, stocks depleted and buyers no longer come.

5.2 The contribution of NTFPs to the livelihoods of village members

Non-Timber Forest Products are widely used by village inhabitants along the Sebangau River but to varying degrees. NTFPs featured on the main livelihood activities named by village heads (table 4) with fishing ranked the second main income in three villages and first in one, Gemur was third in two villages and jelatong ranked fourth in Kerengbangkirai. Local records only highlight economic needs, not subsistence. However, estimates[10] of the number of individuals involved in different activities reiterated and added to the products in table 4. Fishing was ubiquitous with 'almost everyone' in every village partaking. However, other products featured less or not at all; their importance varying in different places. Jelatong collectors were restricted to Kerengbangkirai (estimated 20 to 70 people), as were bat collectors (15-30 individuals). 16 – 40% of the population of Bantanan and 50% of Sebangau Mulya were thought to collect Gemur. Rattan is used by the majority of fishermen to make traps, but collection for sale is less with five people in Bantanan and 5% of Muara Pangkuh now splitting rattan to sell to others to make mats. In Bantanan, 15% use umbut (the only place mentioning umbut). The Sebangau Catchment is mostly Muslim so hunting is limited, in Sebangau Mulya pigs are pest, they are caught and either set free or given to other religions to eat. Five to six people in Kerengbangkirai were thought to hunt, two Christians in Bantanan and one man in Muara Pangkuh.

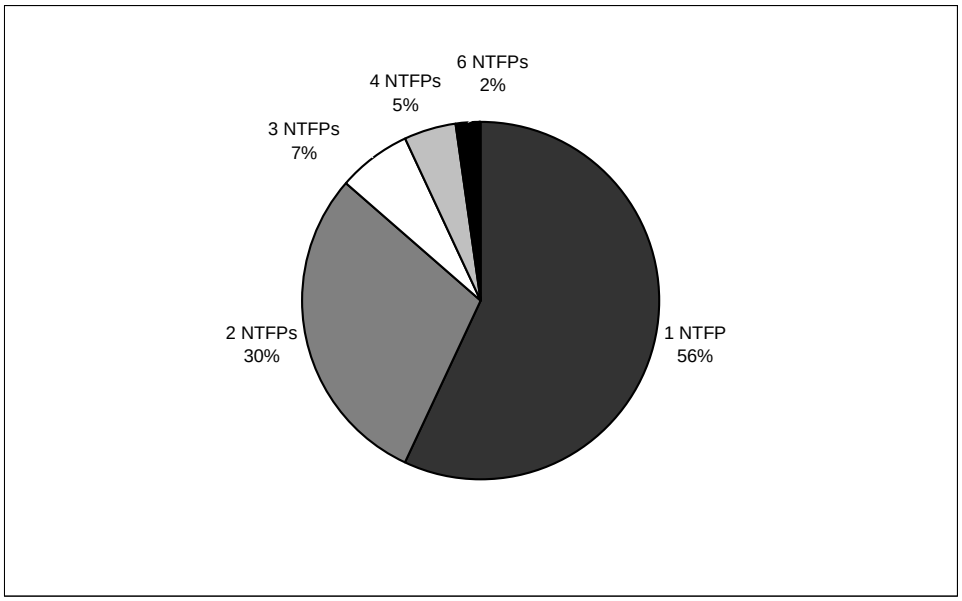
Table 4: Main livelihood activities shown in official documentation

Logging	3	2	1	1	2
Farming	1	1			3
Government	5	4			
Fishing	2		2	2	1
Gemur		3	3		
Jelatong	4				
	KB	SM	MP	S	B

It became clear from the surveys that NTFPs were important to those questioned for a diversified livelihood strategy. Figure 4 shows that although the total income is derived from only NTFPs by 41% of respondents; logging, one of the main causes of forest destruction, with NTFP collection features in 40%. Of the loggers a mean 83% of their income is provided by timber, for those logging and farming 28% and 5% respectively and for farmers 28% is from crops, the majority derived from NTFPs.

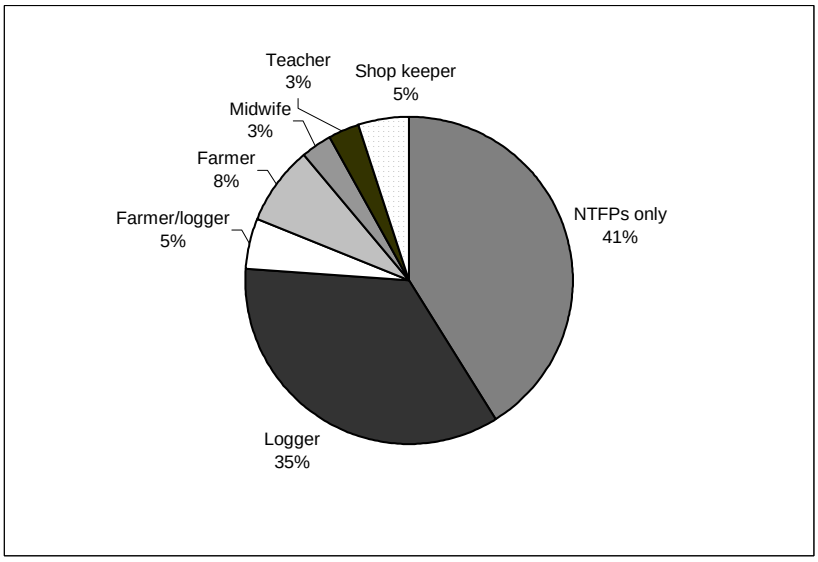
[10] These figures are based on individuals estimates of totals not direct counts so must be treated with caution, they are provided as an indicator of the prevalence of NTFP usage.

Figure 4: NTFP compatibility with other employment (including collectors for both subsistence and economic needs)



In determining the reliance on NTFPs at present, figure 5 indicates the number of NTFPs used by any one individual. It is clear that the majority of collectors use only one NTFP for their income or subsistence needs (56%). The most used NTFP is fish (40%), followed in descending order by gemur, bats, birds, jelatong, rattan, and pigs. Of those using two NTFPs the most popular combination by almost two-thirds of those respondents was fish and rattan, fish appearing in three-quarters of all combinations of two. Three NTFPs were split equally into gemur, bats and fish; fish, deer and birds; jelatong, gemur and rattan. Those using four began to include more easily gathered NTFPs in the immediate locale such as purun and umbut, with fish and rattan used most.

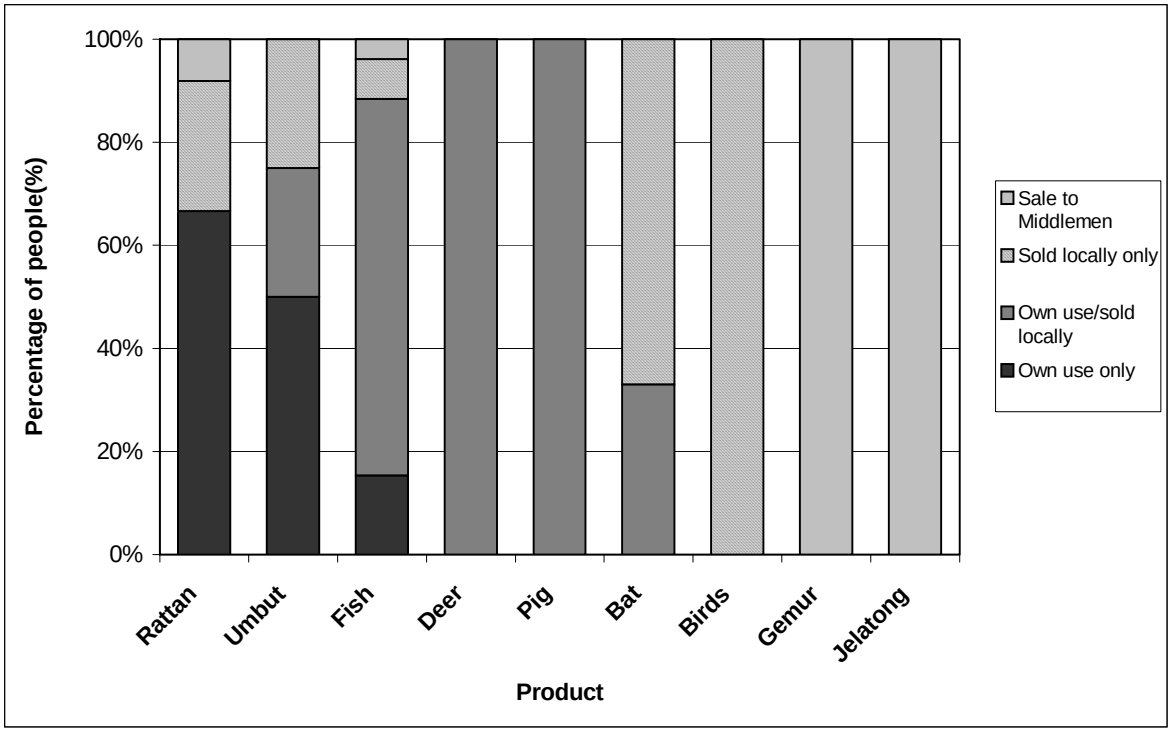
Figure 5: Percentage of respondents using one or more NTFP



NTFPs are not used systematically every year or all year by all respondents; they have a role in providing a buffer in times of need and in providing income in other sectors of employment. Indeed 20% of collectors used to be loggers or work in processing in the sawmills (excludes collectors who still log). Indeed, in the wet season logging is the main activity for many, in the dry season NTFPs are used as an alternative source of income. One man explained how he collected gemur but used the funds for farming. Likewise, another was able to affordably collect gemur by previously logging.

NTFPs have different relevance to livelihoods, some are only collected for own use, some are used by individuals and sold locally, others collect only for local sale and a further category only collect for sale to middlemen the final destination being a warehouse. Figure 6 below indicates the percentage of individuals treating the products in these different ways. For the category 'used by individuals and sold locally' it is interesting to note how they split the actual product. The mean percentage of fish used by the individual is 25% with 75% for sale. Umbut is split 50-50, bats sales reach 70% of the total, only 5% of deer is eaten by the collector but 30% of pig. In addition of rattan 87% of own use is for making fishing traps the remainder used by jelatong collectors.

Figure 6: Chart showing the destination of each NTFP. The percentage of the total number of collectors for each product is indicated.



5.3 Potential for NTFP use in conservation

Successful use of NTFPs in conservation have been shown to rely on a number of factors; sustainability, seasonality, market stability and middlemen, and land tenure. The following results will be under these sections.

5.3.1 Environmental Sustainability

Extensive ecological information including life cycles, reproduction, population fluctuations, responses to harvesting, is required to determine sustainable usage. However, local individuals experience is valuable and information on harvesting methods is shown in table 5, changes in yield and predictions on the health of products in the future is a good indicator for areas of concern.

Table 6: Harvesting methods of NTFPs

PRODUCT	HARVESTING METHOD
Gemur	Following a survey period of 7-15 days to find sufficient trees, a further week is spent felling trees, stripping the bark with a hooked knife then drying. The product is removed along the canals in the wet season or carried on the back.
Jelatong	1km transects containing 50 - 150 trees are tapped in one day. Most tappers owning (by marking the trees) 9-11 blocks. The tree is slashed in a V-shape and rubber trickles in to a 10cm x 30cm bag taking 0.5 - 2 hours to tap. For good quality latex a tree can only be tapped twice in one month so once all blocks are tapped (1block/day) they return to the start. Logging canals are used to store and transport the jelatong. Tapping can only start after 20cm diameter (MoF 2002).
Fish	Six methods are used to catch fish, the first five 'traditional' methods are considered low impact and traps can be (and frequently are) set to release smaller fish allowing them to grow. Rods are used all year (1 to 100 used on a trip). Nets are left for two days then checked, spread along river edge. Shallow Baskets are useful in shallow forest pools especially in the dry season to scoop fish. *Buwu*, large, elliptical, rattan traps are left in the water for 2-3 days often 5-10 are used at once as are *pangilar*, large, cuboid, rattan traps. There is concern over electricity, an electric current from a battery passes to the water via two metal rods killing most fish.
Bats	A forest site is cleared up to $100m^2$ with a tower up to 10m tall. Nets are raised on a pulley system and are attached to two poles high in the canopy up to 100m away. One bat is saved from the previous night's catch and tied in the tower acting as bait. Others caught are stored in this way until space is depleted, then they are stored alive in a darkened box till the following day. On high catch nights, many are killed immediately due to lack of storage space.
Rattan	A knife is used to cut the stem at the base and remove the sheath. It may then be processed (village members split the stem which is sold to make mats. In a warehouse rattan is heated in diesel oil to bring out its colour and preserve it.
Umbut	A knife is used to cut the stem at the base and then to remove the sheath.
Pigs and deer	Trapped using a noose snare, the animal enters the noose on the ground it triggers the rope to tighten (guns may be used on pigs when collecting for themselves).
Birds	Strips of coconut palm are dipped in rubber. A tree is then climbed and the strip is stuck to a branch. The bait (about 7 live birds) is then stuck to the strip; other birds join the bait birds and stick too. By shaking the tree, the coconut strips (and birds) fall to ground.

Gemur (shown in figure 7)

Figure 7: Gemur bark drying in Sebangau Permai 1 (near warehouse) (photo by author, 2002)

All gemur collectors and the gemur warehouse in SP1 reported a decline in size, lower quality harvest (thinner bark) and 55% a decrease and 18% no change in quantity in the species during the last 12 years. Table 7 indicates that for those respondents who have collected gemur for more than nine years tended to notice a decrease in yield. The first entrant in the table noted a large increase because he went on a greater number of trips but the amount for each trip was the same. Excluding this result a moderate negative correlation ($r = -0.5$) was found showing those collecting gemur longest saw the greatest percentage decrease. When accounting for effort those showing a decrease in yield (kg/day/person) increased to 64% of the total and 18% still no change; this is shown in figure 8 below. The present estimated mean annual yield[11] is 3.2 tonnes (ranging from 0.5 tonnes to 48 tonnes). In addition collectors have to collect more trees of a smaller diameter to harvest the same quantity as previous years. Figure 9 below shows that to get 1 tonne of gemur in 1990, one tree of 100cm diameter could be felled, however by 2002 a mean 160 trees of 20cm diameter are needed to produce 1 tonne of bark. Indeed, 55% need to travel further now to find trees (the remaining 45% had only started in 1999 or later, so did not notice a difference in travel). The increased travel distance is between 1-15km greater, with 10km the mode. The reasons given for this decline are competition from many collectors, and the nature of harvesting (i.e. killing trees). Of those surveyed

[11] This figure is calculated throughout using the quantities gathered in one trip (a time period easier to give for most respondents and varies from 1 day to 1 month). If a difference is found wet/dry season quantities are accounted for. This figure is then multiplied using the annual number of trips (effort). The mean of all respondents is then calculated. Considering the sporadic nature of some collecting activities, this figure must be treated with caution.

one-third consider gemur will be available in 10 years because small trees can grow (8% thought there was no threat to its survival), 17% suggested the resource would be limited and 50% that it will not be available with forest fires and excessive cutting the largest threat.

Table 7: Table showing percentage yield change of gemur (kg/yr) since the year of starting

NUMBER OF YEARS	2002	START	% CHANGE
2	48 000	3000	+ 94
2	2000	1950	+ 3
2	15600	15600	0
2	1800	5700	- 68
4	455	300	+ 34
4	1000	1000	0
9	6000	10000	- 40
9	1200	1600	- 25
10	300	1000	- 70
11	1800	2400	- 25
12	1800	6000	- 70

Note: Dark grey shading shows decline, light grey indicates increase.

Figure 8: Actual change in yield (kg/day/person) accounting for effort.

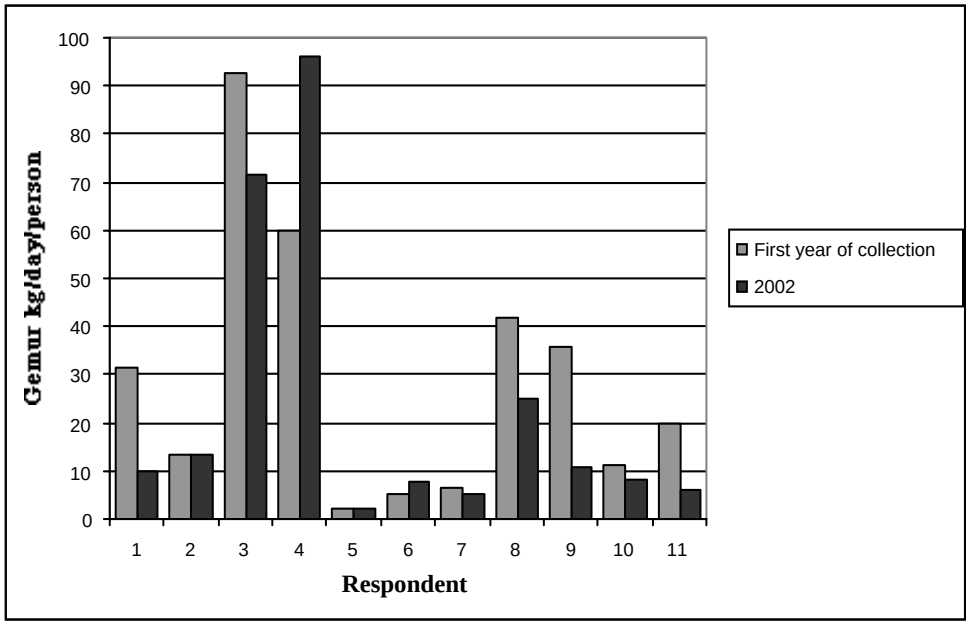
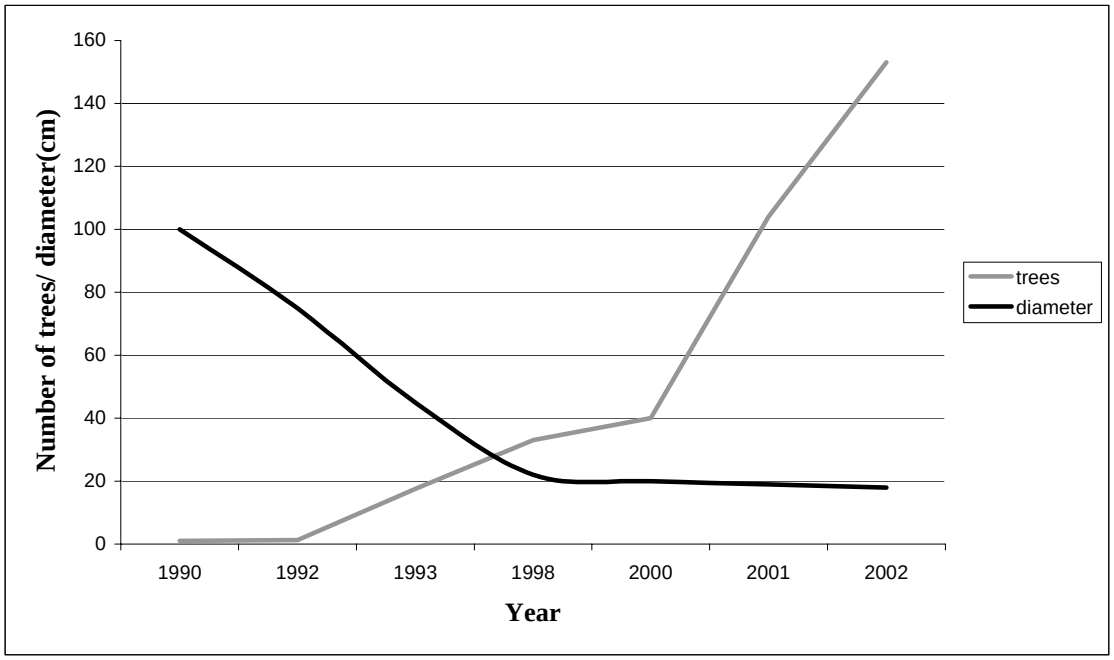


Figure 9: Graph showing change in the number of trees harvested and their diameter over time to equal one tonne



Jelatong (figure 10)

Figure 10: Jelatong tapping (left), jelatong setting (30kg blocks) (right) (photos by author 2002)

All the respondents found this NTFP had not diminished over the decade as a tree can produce for its full life unless damaged; the estimated mean annual yield is 52.6 tonnes/year/person (ranging from 3.6 tonnes to 100 tonnes). However, threats of fire (25%) and logging of jelatong trees (50%) made 17% of respondents fear the resource would be limited in the future, the remaining 83% feel it will be available.

Fish (figure 11)

80% of those fishing thought there had been a decline in quantity over the decade, however, 99% of all the respondents reported a decline in fish size within individual species caught and large fish were caught less frequently. However, table 7 below shows the actual annual yields recorded with only 58% showing a decrease and 21% no change. It is interesting to note that 92% of those noting a decline have fished for three years or more; electricity use commenced three years ago in 1999. There is a weak negative correlation ($r = -0.2$) showing the more years of fishing the greater the percentage decrease. All except one respondent (who had recently arrived from Banjermasin) used traditional methods, the threat from electricity was stated to come from 'outsiders' from Banjermasin and Kapuas region; an influx of up to 1000 people along the Sebangau river during the wet season for logging and also fishing affects the resource base[12]. The

[12] People from Banjermasin started to settle in Kerengbangkirai in 1995, looking for work in the lucrative logging industry they discovered there was not sufficient work and started using fishing as an alternative source of income.

estimated annual mean yield for 2002 was 973 kg/year/person ranging from 80-3000kg/year/person. Indeed, one respondent, a full time fisherman in Kerengbangkirai, had already sought other sources of income and opened a shop, which his wife looked after. Discussions with fisher's highlighted concern over the destruction of fish breeding habitat by logging and the Mega-rice project. In addition electricity use kills both large and small fish unselectively and was considered the largest threat (99%). However, other fears of competition from other fishers, forest destruction and building logging canals that disperse fish over a wider area, were also added. 25% feel fish will not be available and 25% say it will be limited in 10 years unless there are less collectors, the habitat is protected from electricity users, indeed, one respondent suggested if he had his own river he could control harvesting and in Muara Pangkuh there will be fish if no-one lives there. In the latter point many have left the village already due to diminishing availability of logs and closure of saw-mills 'as long as the forest exists there will be people living there' (Collector, Pers. Comm. 2002).

Figure 11: Fisherman and traditional traps

Table 7: Table showing the change in total fish yield (kg) compared to 2002 since year of starting activity

NUMBER OF YEARS	2002	START	% CHANGE
0	118		
1	260	260	0
1	425	425	0
2	2400	1000	+ 58
2	120	90	+ 25
2	1000	300	+ 70
2	640	640	0
2	1460	2900	- 50
3	364	468	- 22
3	2080	3840	- 46
5	552	840	- 34
6	464	2240	-79
6	60	5000	- 99
7	880	2400	- 63
10	260	520	- 50
11	608	864	- 30
17	650	750	- 13
21	3000	1000	+ 67
27	3500	200 000	- 98

Note: Dark grey shading shows decline, light grey indicates increase.

Bats (shown in figure 12)

Figure 12: Collecting bats in the forest (photos by author 2002)

The majority of bat collectors and sellers noted a decline in bat quantity over 10 years (75%). The mean annual yield of bats collected being 475, ranging from 100 – 850 (one man noticed a 35% decline since 2001 of 2400 to 850 bats with the same effort to collect). Bats sellers bought bats from catchers around the forests of Kerengbangkirai in the Sebangau, but also from outside the catchment in Tangkiling, East Kalimantan and Kapuas region, South Kalimantan. The reasons given for the decline are human population increase leading to forest clearance and the 1997 forest fires, both leading to diminishing quantities of fruit for bats. 25% considered that bats would be limited in the future with fires the largest threat followed closely by logging. Respondents were unsure of the proportion of juveniles caught (which would adversely affect sustainable harvesting of bat populations). One seller sold 50:50 of small (0.5kg) and large (1kg) fruit bats at present and another noted that following the 1997 fires the proportions were 80:20, by 2001 they returned to 50:50 and in 2002 small bat catches had again increased to 75:25. They were mostly unsure of the proportion of male and female bats caught though two thought 50:50. In addition to catching bats there is concern over the bi-catch. The capture of a Black flying Squirrel was witnessed which was then eaten. The catchers said this was not a frequent occurrence. They occasionally catch larger birds, once a large raptor thought to be an eagle and more frequently owls[13], which are released.

[13] One owl species, translated from local dialect to mean Brown Wood Owl is always released; local Dayaks fear them due to its child like screaming call.

Rattan

For those collecting only small quantities (20-50kg/year) no change in effort or yield was noticed, however, one respondent collecting larger quantities for the warehouse in Palangkaraya had collected rattan since 1992 and noted a decline from 10 tonnes to 1.1 tonnes over this time. The warehouse itself, however, is only limited by its 300 tonne capacity not the availability of product (figure 12 shows the warehouse). All considered the resource would be available in 10 years, the only threat being fire. Although the species is not known it became apparent from drawings and descriptions that the species most commonly used had the ability for vegetative re-growth from the base and was probably not the larger, solitary standing varieties that are killed when the stem is cut (Dransfield 1988, Peluso 2002).

Figure 12: Workers preparing rattan for export in Palangkaraya (photo by author 2002)

Umbut

Like rattan, no one has noticed a decline over the years and think it will be available in the future, 50% of respondents thought there was a threat of fire, the other half considered there to be no threat.

Pigs and deer

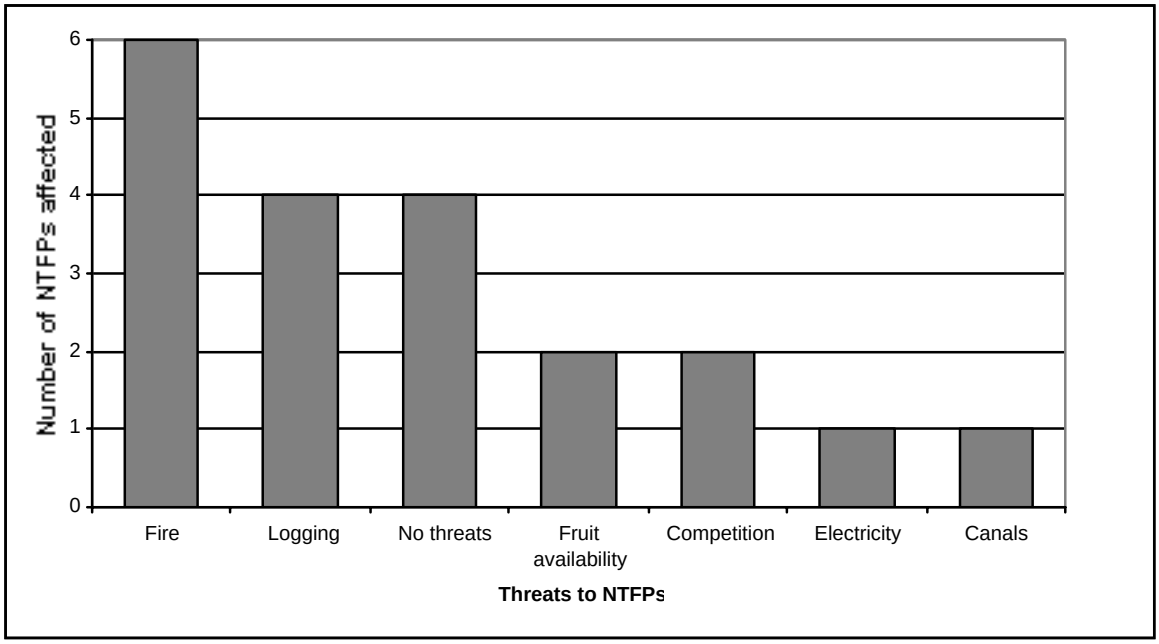
Half the hunters reported a decline in numbers of pigs however, they said this was dependent on fruit supplies so annual figures ranged from 6-15 pigs/year/person. There was a consensus that pigs will still be available in 10 years and the only threats being fruit availability and less so, fires (which could threaten fruit). It is difficult to judge the trends in hunting as the process relies to a large extent on luck, deer ranged from 0 – 4/person/year with no apparent trend.

Birds

Bird collectors were split equally; 50% thought there had been a decline in numbers caught and would not be available in the future due to the competition between catchers, the opposite was true of the remainder, believing there to be many birds in Central Kalimantan.

The threats affecting a total of seven NTFPs are shown in figure 13 below, shown in order of the threat affecting the most NTFPs to the least widespread threat (but no less valid to that product).

Figure 13: Graph showing the number of NTFPs considered threatened by different factors



5.3.2 Seasonality

Although all the NTFPs are available all year socio-economic and practical factors curtail their collection. For loggers and farmers using NTFPs as their secondary income, the annual livelihood cycle is dictated by their primary occupation. Therefore loggers for example, who only work in the wet season when log transportation is possible, may collect fish, bats, rattan or pigs in the dry season but would find it more effort to collect jelatong or gemur. Fish are abundant for one harvest at the start of each season, the greater being the start of the wet season. This is because the fish breed in the wet season

causing a population increase at the start of the season, as the water levels rise the fish become dispersed becoming increasingly hard to fish. At the start of the dry season, the water level declines, for a period the larger wet season population becomes concentrated allowing easier harvesting. Both gemur and jelatong become difficult in the dry season

as the canals have no water limiting what they can physically carry. Flowers and fruit affect the abundance of bats and birds making harvesting easier. Rattan and umbut collectors will collect all year, but prefer the dry season (depending on whether they need a boat to reach the collection site). Table 8 below shows these preferences, restrictions and possible combinations of NTFP use and their relation to farming and logging. The dark grey areas indicate the ecological potential of when the product is available, darker grey areas within these show periods of product abundance. The lower lighter grey line for each NTFP indicates the villager's activities in the two seasons. Price also varies between the seasons, which has a bearing on collection, when effort gains the most financial reward; this is shown in the following section.

Table 8: Table showing seasonal availability and harvesting of NTFPs

	WET SEASON								DRY SEASON			
	O	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**
Timber	All year											
	Only transport in wet season											
Farming	Plant		RICE			Harvest						
						Plant vegetables		Harvest vegetables				
												CORN
Gemur	All year											
	More taken, water in canals allows transport by boat								Restricted, leave in forest or carry on back			
Jelatong	All year											
	Only transport in wet season								Sometimes still collect, can not transport			
Fishing			All year									
	Depends on other activities, e.g. depends on crop cycle for farmers; for a housewife on her daily routine; fishermen every day											
									Loggers unable to fish in wet season			
Pig Hunting				All year								
								Fruit season, lots of pigs, busy rest of year so not worth effort				
Deer Hunting												
									No tracks in wet season			
Bats			All Year									
	Fruit season so >50 bats/night		Not as many bats so many don't try to catch									
Birds	All year											
	Flowers blossom, more available											
Rattan	All year											
	When needed/ not busy collect								Prefer collecting in dry season, less mosquitoes, stems not under water			
Umbut	All year											
	Depends where collecting, some need boat to reach source, so only in wet.								Prefer dry (see rattan)			
Purun	All year											
	Collect when need											

5.3.3 Markets and middlemen

The market price has an affect on the collection of NTFPs; this varies seasonally and annually, depending on overall international and national markets, warehouse conditions and abundance of the product in nature. In the dry season fish costs 2000rp/kg -

6000rp/kg, however in the wet season this increases to 3500 – 8000rp/kg. More can be achieved by preserving fish with salt. Wet season variation between sale prices had relatively high variation depending on size of fish and where it was sold (%CV[14]=46). One collector judged the income level of his customer before giving a price. Rattan has the highest variation (%CV=83) according to whether it is for sale to other village members or to middlemen, between 800rp/kg to 2000rp/kg. Indeed in 2002 the warehouse paid 2000rp/kg and in 1993 800rp/kg suggesting that local villagers are unaware of the potential costs. Bats vary according to the time of year, whether they are dead or alive, small or large. In 2002 bats sold on average for 5000 to 12500rp/bat (small dead to large alive), buying for 4000 to 10000rp/bat this may increase to 17500 rp for large, alive bats in times of scarcity. Since 1990 there has been a 10% increase in price indeed at abundant times of August and September three large bats could be sold for 2000rp. In 1990 to 1996 300 bats/day could be sold in these months compared to 40-100 bats/day in 2002. Pig prices have also increased, in 1994 from 5000rp/kg to 15000rp/kg in 2002; this was because fewer pigs were caught for sale. Wild pig is cheaper than farmed pig due to lower capital output; indeed customers prefer the taste of wild pig as it eats only forest vegetation. Gemur varied greatly (%CV = 80) depending on the quality of gemur, the individuals boss and the position along the line of traders (collector, middleman or exporting warehouse). The lowest price 120 rp/kg to 2000rp/kg amongst collectors. Middlemen received from the warehouse between 600 rp/kg for wet bark to 2500rp/kg for dry, this price has not changed since 1999. However the warehouse sold gemur for 3000rp/kg in 1999-2001 and 3500 – 4000rp/kg in 2002.

Competition from alternative jobs and overseas products affects the collection of products and number of people involved. Many jelatong collectors started in 2000 due to a higher price for the product at that time. The jelatong warehouse in Palangkaraya takes raw materials to the Sampit headquarters, in 1991-1993 he transported 100 tonnes/month from the Kahayan, Katingan and Sebangau river areas, since 2001 easier jobs such as logging and gold mining have attracted collectors in the Kahayan and Katingan with only the Sebangau providing the 20 -25 tonnes/month; the price he buys for has increased in this period from 750 rp/kg to 2500 rp/kg[15]. The payment received by collectors did not vary greatly between collectors indicating a fair price to all (CV%=2). The gemur warehouse in SP1 provides an overview of gemur movement in the area, owned by Pak Ipah, the main exports to Surabaya and Jakarta of the Sebangau gemur trade pass through his warehouse. It was noted that since taking over the 15-year-old business in 1999 the quality had declined and although Central Kalimantan gemur was once popular in Java, they now prefer gemur from Irian Jaya. This competition has meant since 2001 that his four 100 tonne capacity warehouses are full because of low demand and prices. He will not sell a tonne for less than 3 million rps. If the warehouses are full he can not buy from collectors, in addition the lower quality and further distance to find gemur has seen his permanent employees decline from 10 groups in 1999 to 6 groups in 2002. The total quantity leaving the Sebangau between 1999-2001 was 552 tonnes/year, in 2001-2002 this was down to 510 tonnes/year (although the rough sea crossing prevented more being

[14] Coefficient of Variation
[15] The selling price was not known as the main Sampit factory arranges this.

taken). Table 9 shows the total cost (and factory profits) of the gemur leaving the Sebangau in 2002 ($37185 - 59476) and 1999 ($22865)[16] respectively.

Middlemen provide a funding service for their collectors, without which collectors stated they would be unable to harvest, depending on bosses this is between 150000 – 500000rps/month long trip, for food, equipment, and possibly free use of the bosses Klotok (boat transport).

Table 9: Table showing costs, income and profits of the gemur warehouse (Pak Ipah, Pers. Comm. 2002)

COST

ITEM	RATE	2002 TOTAL (rp/year)	1999 TOTAL (rp/year)
SECURITY GUARD (1)	100 000rp/month	1 200 000	1 200 000
STAFF TO LOAD SHIP (6)	10 000rp/1 tonne /person	30 600 000	60 000 000
CONTAINERS	800 000rps/8 tonnes	52 800 000	57 600 000
GEMUR BOUGHT (510 000kg/yr 552 000kg/yr)	2500rp/kg	1 275 000 000	1 380 000 000
	TOTAL COST	**1 359 600 000**	**1 498 800 000**

INCOME

GEMUR	3500 - 4000 rp/kg (2002) 3000rp/kg(1999)	1 785000 000 - 2 040 000 000	1 656 000 000
	TOTAL INCOME	**1 785000 000 - 2 040 000 000**	**1 656 000 000**
	TOTAL PROFIT	**425 400 000 - 680 400 000**	**157 200 000**

[16]Exchange rates, rupiah to $US, 2002=11440, 1999=6875 (UN 2002)

5.3.4 Land tenure

Less information was generated about land tenure in the time available. However, it is clear that beyond the overarching state ownership local systems are in operation, yet ill equipped to deal with the external threats of other NTFP collectors or loggers. This is shown in table 10 below. Individuals use symbols to mark ownership, which is generally

respected by local users. Jelatong collectors all own their own trees on a first come first served basis by creating the $1km^2$ transect. The making of expensive canals (one canal maker was paid 5000rp/$70cm^3$ of canal) denotes ownership of an area, however in Sampang loggers come in the wet season and make canals without permission, meaning the locals can not work in that area reducing income for the village. In the past people from Sampang gave instructions to outsiders on forest use but were ignored, instead many outside loggers steal trees in the night. Muara Pangkuh's licence system again did not protect against outsiders, nor did everyone in the village have a licence. For 1km of river a user must pay the licence owner 200 000rp for six months put it seemed to be up to the owners discretion how many people were allowed to use the resource at one time, one respondent avoided this cost by travelling 30km to avoid symbols. Canal owners charge for the usage of their canals between 10000 and 20000rp for 100kg of product, this mostly affects jelatong and gemur collectors.

Table 10: Table showing local property regimes

PLACE	LAND TENURE
Kerengbangkirai	Unknown
Sebangau Mulya	Each family has 2 hectares, although only 1 ha in use, for house and farm. The other ha requires irrigation, fertilisers and lime (once provided by government when first moved)
Sampang	Open access to forest. However, if canal constructed around an area it becomes private property. Canal making is expensive and requires permission from village.
Muara Pangkuh	Licence arranged for village members by village head for 1 km^2 plots in surrounding forest and along river. Owners of 1 km^2 can rent out land to others.
Bantanan	Common property - clear where want to - normally can only afford to clear 1-2 hectares.

State ownership fairs little better at preventing illegal activity, although some NTFP collectors used to be loggers who stopped from fear of heavy fines, there is little monitoring of activities. Fines exist for cutting jelatong trees however the police rarely visit the area to find 'naughty people' (Collector, Pers. Comm. 2002)

CHAPTER 6: DISCUSSION

The results indicate that NTFPs play a vital role in the functioning of the Sebangau communities. However, the magnitude of reliance varies from individual to individual. Fishing clearly has the most widespread effect for subsistence and economic needs. Gemur, jelatong, bats and some rattan collection forms the main annual income for some families, without which alternative incomes would have to be sought. For many the remaining products can augment incomes and provide food when needed, thus spreading risk, perhaps when crops fail, or during floods, the latter have been reported more frequently since land use change has increased. Indeed the level of usage indicated justifies discussion of the potential for integrating NTFP usage into a conservation strategy. In the Amazon only two main products were used in extractive reserves rubber and Brazil nuts, in the Sebangau a number of the products mentioned may have potential and warrant further focus even though at present their potential may not be apparent.

For the harvesting of NTFPs to have a substantial impact on the conservation of biodiversity the NTFPs used must have both limited impact on the forest structure and biodiversity and provide long-term, year round livelihood security for collectors and traders. The relationship between forest and this livelihood must be evident (Salafsky *et al* 2001). However, results from the Sebangau echo concerns of previous studies on NTFPs potential to fulfil these criteria. The results indicate the environmental sustainability of gemur, fish and bats is questionable. Their excessive removal not only affects the individual species, leading to genetic impoverishment or extinction (Arnold 2001), but in addition to large fauna, such as pigs and deer, many commercial fish are key seed-dispersers thus adversely affecting the long-term preservation of the forest (Redford 1992). Indeed although respondents were aware fish sources are declining they link this primarily to electricity use when it is probably a combination of factors (logging, overfishing) reducing the resilience of species, thus this lack of linkage may not promote ardent protection of forest habitats. Although rattan, umbut and jelatong may be used sustainably their market for export and, in the latter, need for each individual to use many trees makes them liable for forming plantations, limiting widespread effect to many individuals because of spatial constraints. Further concerns are expressed by Browder (1990, 1992b) that NTFP reserves are social spaces where fewer, marketable species are preferred rather than coinciding with biologically rich tracts of forest.

NTFPs generate a low income with high transport costs, thus domestication with lower costs and higher income poses a viable alternative to extraction altering the link between livelihood and biodiversity (Anderson 1992, Homma 1992). If this uses land already cleared this could be a beneficial land use, however encroachment would be detrimental to the forest structure and would decrease viability of maintaining the forest, by desegregating NTFP benefits from conserving habitat (Prance 1998). Indeed Salafsky and Wollenberg (2000) suggest NTFPs provide relatively weak links due to reliance on only a few species and this potential for domestication. Anderson (1992) indicates that extractive reserves alone seldom provide sufficient income for extractivists. There is also no evidence that NTFPs in the Sebangau could raise income levels at present without domestication, however there is potential for post-harvest processing in rattan, this has been realised already by mat makers in Bantanan, more revenues could accrue at local

level. Fundamentally, however, any management system must make sure locals want to continue or increase NTFP use; many interviewed saw plantations as a good income, and did not want to rely on the forest.

In the Sebangau logging and agriculture, both detrimental to the forest in present use, are inextricably linked to NTFP collection in this study. Indeed logging has opened access to the forest for more NTFP users (compare Peluso 1983). This poses problems; it is unlikely that if logging were successfully reduced to sustainable levels in a conservation area, that any NTFP collection at present levels of use would provide adequate, substitutable income. Indeed the sawmills are key in providing income to NTFP traders and farmers. Indeed, 'if both URM and SSI [the two main sawmills] close, all the villages along the Sebangau will leave' (URM Pers. comm. 2002); good for conservation, but it moves the livelihood pressures elsewhere, perhaps to other areas of forest.

In addition to long-term environmental sustainability, the long-term livelihood security to NTFP collectors is debatable. All products, except rattan and umbut, are difficult to obtain year long providing variable income, indeed products such as rattan are only obtained sporadically. Stable markets provide incentives to conserve stocks, considering the variability throughout and over the years there is little incentive to preserve products that may have no future value (Pye-Smith 2001). Jelatong, rattan and gemur have relatively stable markets seasonally but only jelatong annually. Indeed gemur is suffering from international market competition.

At present distance from markets means individuals realise few benefits. Southgate showed intermediaries gain most revenue, however in the Sebangau not a great price increase is evident and only passes two to three hands if at all (also found by Padoch in Peru (1988)). Although collectors do not receive the full price benefits due to increases along the chain, other benefits are provided by middlemen. Although accruing debt, in their absence harvesters would earn nothing (compare Salafsky *et al* 1993). The most significant use of middlemen is for gemur. However, for other products village members often can not easily or affordably make frequent visits to the markets of Palangkaraya therefore it is more beneficial to receive a lesser payment by selling locally or to middlemen than loose valuable time. The decline in abundance of NTFPs from the threat of logging and fire in the region, means a decision that livelihoods should rely on NTFPs should be made tentative (compare Shanley's study of Belém (2002)).

Other studies have highlighted the imperative need for secure property rights to enable long-term economic and environmental sustainability (Dore *et al* 1994, Hodson *et* al 1995, Pye-Smith 2002). This is also apparent in the Sebangau. Property rights are unclear and monitoring and sanctioning is not adequate to mitigate external threats. Direct linkage with the forest is insufficient to protect against outsiders at present as suggested in Salafsky and Wollenberg's (2000) linkage model. However, there is difficulty designating any form of property considering the number of stakeholders (including outsiders who also use the Sebangau resources) interested in any proposal. However, laws for replanting gemur or not using electricity, for example, would be small measures for long-term security and could allow outsiders to continue using the resource under appropriate land tenure.

CHAPTER 7: CONCLUSION

NTFPs have a key role in providing security to diversified livelihoods in the Sebangau Catchment. However the level of integration and relevance of NTFPs in villager's annual activities is diverse; any forest management strategy should provide the flexibility to accommodate this diversity. Owing to NTFPs important role this study confirms that local communities should not be excluded from using the forest products on which they depend. However, although many limitations to the use of NTFPs have been highlighted, there are indications that some NTFPs may be more appropriate for an ICDP than others. Before decisions are made regarding which NTFP has most potential, further research is needed on ecological based sustainability to be used in conjunction with the socio-economic study presented here. Owing to the inconsistent use of NTFPs it may be of greater benefit to include local forest access in a multifaceted forest management scheme, rather than sole reliance on NTFPs. This could include sustainable timber harvesting which is obviously a major income provider. Indeed if solely NTFP use is promoted the projects sustainability may be adversely affected when individuals stop using NTFPs if better livelihood options become available in the future. Any plan would need a strong and appropriate system to monitor and sanction this, as forestry regulations at present are not heeded. A consideration in any conservation strategy devised is that: 'if forest reserves of any type become islands in a raging storm of rainforest destruction, in time they too will be doomed' (Browder 1992a: 40).

7.1 Future research

The findings presented in this paper provide an initial overview of the role of NTFPs to the livelihoods of rural communities in the Sebangau Catchment. More needs to be understood before any forest management is developed using NTFPs, even if it is just allowing their use in a buffer zone.

- Find the level of use by outsiders who also use the Sebangau catchment in the wet season.
- Further study of individual products ecological sustainability (using life cycles, reproductive potential etc) juxtaposed with the socio-economic aspects highlighted here.
- Need for local people's involvement, as key stakeholders, to increase uptake of any project. It is possible that individual agendas may exist, such as wanting lucrative palm oil plantations which could be detrimental to the forest, therefore studies of social relationships and hierarchies must be undertaken
- Study prospects for implementing sustainable timber extraction, which is integrally related to livelihoods
- Possibility of other methods of development which would beneficially affect the forest, such as improving education or health levels which may change the relationship with the forest (indeed if these increased in the future it could jeopardise the usefulness of NTFPs in conservation).

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APPENDIX 1

Survey of Non-timber forest products **Name** **No.**

(Collectors)

Date:

Settlement name: Settlement type:

Population size

Sex: M F Age: Religion:

Current occupation: Previous occupation

1. What forest products do you collect/use:
    a. Jelutong (pantong) Y N
    b. Rattan Y N
    c. Gemur Y N
    d. Bats Y N
    e. Parrots Y N
    f. Fish Y N
    g. Fruit Y N
    h. Pigs Y N
    i. Other animals, if so what? Y N
    j. Medicinal species Y N
    k. Timber (not for trade) Y N
    l. Other

Market:

2. who is it collected for:
    a. own use
    b. individual sale
    c. sale to business
    d. other

3. Is it then sold
    a. locally
    b. in Java
    c. Internationally
    d. Other
    e. Don't know
4. How much do you sell it for (per kilo?)…
    a. at present
    b. last year
    c. 1996 (pre crash)
5. What was the best price worst price
    a. So far this year …… ……..
    b. 2001 …… ……..
    c. Since starting …… ……
6. on a scale of 1 to 10 how do you feel the demand has changed since 1997 (5= stayed the same, 1 declined, 10 improved

    1 2 3 4 5 6 7 8 9 10

Seasonality (do seasonal calendar):

7. How many days a year do you spend harvesting the product
    a. 1-2 weeks
    b. 2-4 weeks
    c. 1-3 months
    d. 3-6 months
    e. 6-9 months
    f. 9-12 months
8. Which months is this in

    J F M A M J J A S O N D Why?.....
9. How does the wet season affect the activity?

10. What % does this activity contribute to your annual income?

11. Is it your only job Y N

12. What other jobs do you have?

Harvesting:

13. Where did you learn the trade

    a. Family (which member)

    b. Friends

    c. Employer

    d. Other

14. On average what quantity do you extract per week

15. What was the total quantity taken

    a. In 2001

    b. When you started

16. How many years have you done this activity

17. Over this time has the annual yield

    a. Declined

    b. Stayed the same

    c. Increased

18. Why do you think this is (market, harder to find, other)
    ……
    …….

19. Please describe how you harvest the product

20. How many people do you work with

21. Are you aware of other collectors in the area Y N

    If yes, how many

    What do they collect?

22. Is the Sebangau catchment the only area you collect in

23. Do you know how important this area is compared to other areas in Central Kalimantan

24. How do you remove the product from the forest

    a. Along the old rail track

    b. On the canals

    c. Other

25. How much do you spend to extract the product on

    a. Transport

    b. Equipment

    c. Canal rent

    d. Other

26. Do you feel that this product will be available in another 10 years at present yields: Y N Why?

Fish:

27. What species do you collect

28. Please rank these in order of quantity taken (1 = most)

    a. At present

    b. 2001

    c. 1996

29. please rank these in order of sale price (1=greatest)

    a. at present

    b. 2001

    c. Since starting

30. Since starting has total annual yield

    a. Increased

    b. Decreased

    c. Stayed the same

31. Why do you think this is ……...

33. Has there been a decrease in individual fish size within different species since starting

Bats:

34. Do you know which sex you collect?

    If yes, what proportion of each do you take?

35. Do you clear a new area for each season

36. how long can you use a cleared area for before yields decline

Animals/birds:

37. How do you decide which species to hunt

    a. Opportunistic (whilst doing other activity / aiming to hunt)

    b. To order

    c. Other

38. which species have you collected since last July/August

39. How many years have you hunted for

40. How has the quantity of each mammal changed over this time

41. Why is this

    a. Demand has changed

    b. There are less animals

    c. Other

42. what is it used for

    a. pet trade locally nationally internationally (where)

    b. meat locally nationally internationally

    c. own use

    d. medicine

    e. other

APPENDIX 2

Survey of Traders **Name:** **No.**

Date:

Settlement name:

Place of birth: Year of arrival to present area

Sex: M F Age: Religion:

Current occupation: Previous occupation

Marital status: Children (and age)

Market:

1. How many years have you done this activity?
2. Where is the product sold?
3. How many collectors do you buy from?
4. How often to you buy from them?
5. Where are they collecting?
6. Do you buy all the bats offered to you by the collector? Y N

   If no, What affects your choice of how many you take?
7. What percent are sold alive?
8. What percent are sold dead?
9. How much do you buy it for (per kilo/individual?)…

	Alive	Dead
a. 2002		
b. 2001		
c. since starting activity		

10. How much do you sell it for?

	Alive	Dead
a. 2002		
b. 2001		
c. since starting activity		

11. What was the

	best price	worst price
a. So far this year	……	……..
b. 2001	……	……..
c. Since starting	……	…….

12. Why does it vary?

13. On a scale of 1 to 10 how do you feel the demand has changed since you started (5= stayed the same, 1 declined, 10 improved)

1 2 3 4 5 6 7 8 9 10

Seasonality:

14. How often do you try to sell bats (please indicate variation through year)?

15. Which months do you sell the most?

16. Why do you think this is?

17. How many bats do you sell in these months?

    a. 2002

    b. 2001

    c. start

18. On average how many bats do you sell in the other months?

    a. 2002

    b. 2001

    c. start

19. If the quantity has changed, why do you think this is?

20. How does the wet season affect the activity?

21. How does the dry season affect the activity?

22. Do you know which sex you collect

    If yes, what proportion of each do you take?

23. What % does this activity contribute to your annual income?

24. Is it your only job? Y N

25. What other jobs do you have?

26. Are you aware of other sellers in the area Y N

    If yes, how many?

        Where?

27. Do you feel that this product will be available in another 10 years at present yields: Y N Why?

28. What threats are there to its sustainability?