UNDERSTANDING PATTERNS OF RESOURCE USE AND CONSUMPTION: A PRELUDE TO CO-MANAGEMENT

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For co-management of conservation areas to be effective, detailed information on local people's use of natural resources is essential. This chapter offers one method to obtain some of that information, a household recordkeeping study. It is simple to implement and analyze, and provides useful, quantitative data on resource use and income levels. Here we describe the method and present data derived from three such studies of Malay and Iban communities in and around the Danau Sentarum National Park in West Kalimantan, Indonesia. These data show the strong reliance of Malay and Iban peoples on fisheries and forests respectively, and suggest avenues for working with both groups to manage and conserve local resources. This is a companion article to one entitled, "Understanding Local People's Use of Time: A Pre-Condition for Good Co-Management" (published in *Environmental Conservation*) in which we suggest a time allocation method for use in community-based conservation work.

Introduction

In recent years the importance of working with local people in protected areas has been increasingly recognized. There has been a continual stream of information showing how forest people participate in complex systems of resource management and use, often based on long experience with local conditions and involving extensive indigenous knowledge about local flora and fauna. That such ecological knowledge and local natural resources are often intimately intertwined with forest people's cultures and ways of life has also become clear.

However, success in the implementation of such desirable management cooperation has been limited (cf. Wells 1997; Western and Wright 1994), partly we would argue because outside managers often lack appropriate knowledge about local people and how they have traditionally used and managed resources. In order to manage a protected area in a manner that both protects that environment and either maintains or enhances the

quality of life of the people residing in and around it, managers need to know more about existing human impacts on and benefits from that environment. Knowledge of such human patterns can also help managers identify shared goals between local people and conservationists and provide insights on ways to tap into the real management potential that local people represent.

That management of protected areas requires biophysical expertise has long been acknowledged. However, with the recognition that local people must often be involved in formal management, the importance of expertise from the social sciences has increasingly been recognized. There are several kinds of social science expertise that are needed in the management of protected areas, including, for example,

- Anthropological description of the extant human uses of and benefits from the environment (as described in this chapter), as well as the values, norms and goals local people have
- Skills and knowledge of group dynamics for facilitating cooperative interaction and sharing of perspectives among local stakeholders
- Political knowledge to provide a "vertical" bridging function between local stakeholders and the wider governmental, industrial, and conservation worlds

These kinds of expertise have only recently begun to be available to managers of protected areas. Often responsibility for such ethnographic investigations, group dynamics, and political know-how fall to biophysical scientists who may be, quite understandably, poorly prepared to take on such additional (and perhaps unforeseen) responsibilities.

This chapter, based on the conclusion that management of protected areas will increasingly be conducted in a co-management, or partnership, mode, provides one simple recordkeeping method for learning about local people's uses and benefits from natural resources. Because this volume is focused on the management of Danau Sentarum National Park (DSNP), there is more detail about that park than is necessary strictly to demonstrate how to use the method.

Based on experience with people living in other forested areas of Kalimantan and from Giesen's (1986) study of DSNP, we identified a number of issues that seemed significant for improving management there:

- What are the people using from their environment?
- What quantities of important products are they harvesting?
- Who is managing and/or collecting these products?
- Who is profiting from them, and by how much?
- Where are they finding what products?
- What is the balance between subsistence and market uses?

Developing a management plan for DSNP that both protects the environment and maintains or enhances local people's way of life requires knowledge of existing patterns of resource use and standard of living. Without such knowledge, park management could disadvantage local people, fail to mobilize potential positive contributions and, equally important, arouse unnecessary opposition to overall conservation goals.

Capturing the obvious human variation in the area—as the recordkeeping study does—was an important first step at DSNP. Some of the important local variation that emerged from the study, and is discussed below in more detail, includes:

- different resources provided the basis for different ethnic groups' livelihoods—e.g. Iban rice cultivation vs. Malay fishing;
- different seasons brought different products—e.g. for the Malay, honey in January, increased fishing in July and August;
- different resource use patterns characterized different communities—e.g. floating gardens in Bukit Rancong, none in nearby Ng. Kedebu'; and
- men and women dominated in different activities—e.g. for the Iban, male circular migration, female dominance in rice cultivation.

These kinds of variation are common among forest dwellers. Diversity in sources of income and subsistence represent an effective mechanism for dealing with the very real risks that characterize agricultural endeavours in tropical rain forest areas (Dove 1988; Colfer *et al.* 1997a; Wadley 1997a; Puri 1997). There is also commonly specialization or a kind of division of effort, among ethnic or user groups, such as the Malay concentration on wetlands and the Iban focus on uplands. In Long Segar, East Kalimantan, for instance, Colfer found the Kutai emphasizing commercial rattan collection, and the Kenyah avoiding it, with an explicit "division of labor" philosophy. In Sitiung, West Sumatra, the Minangkabau planted rubber and other tree crops which the Javanese eschewed, the Sundanese planted elaborate home gardens including fishponds, and the Javanese focused on rice, soybeans, and cassava production (Colfer *et al.* 1989:91). Each emphasized the link between their crops and their ethnicity. (This sort of specialization appears to have deep historical and prehistorical roots throughout Southeast Asia [see e.g. Higham 1989].)

Such ethnic specialization has important implications for natural resource management and for co-management in general. Although such diversity of use may appear to complicate the managers' tasks, taking it into consideration can contribute to more realistic planning, improved trust and cooperation from local people, nurturing of their initiative, and avoidance of unnecessary and counter-productive conflicts with them. Building on the opportunities, in terms of "social capital" or human resources, available from any community, requires quite specific information about their different forest use patterns (e.g., which plants are most important for which group of people? Where are those plants found? During which seasons are they abundant?).

The kind of data provided by the recordkeeping study must be augmented by cooperative input from biophysical scientists who must play a central role in understanding the conservation implications of these details of local forest use. Local names of flora and fauna must be converted to scientific names; ecological inter-dependencies must be interpreted in light of the impacts of local use on resource availability; the use of indigenous ecological knowledge requires communication and evaluation by those with related expertise (including zoologists, ecologists, fisheries biologists, and botanists).

Another, equally important, component of such co-management, not fully addressed here but mentioned above, is the process of working together with local people. Biophysical scientists and conservation area managers tend to be less accustomed to regular interaction with local people in a partnership mode than are anthropologists. Such interaction, however, is essential for effective co-management. Managing together requires regular communication, as well as an understanding of local values, norms and beliefs. The collection of data in the studies reported here and elsewhere (Colfer *et al.*

forthcoming) can serve as a mechanism for facilitating and ensuring regular interaction between formal conservation area managers and local people—a function of critical importance. (Jeanes [1997] provides a very thorough examination of factors affecting management at DSNP.)

Household Recordkeeping

In this chapter, data from Malay and Iban communities serve as a means to explain a simple method, household recordkeeping, that can help managers to understand how local people use local resources. Such understanding is a necessary first step in using and building on indigenous management systems to fashion new approaches that incorporate conservation concerns in a more meaningful way.

The design of the recordkeeping study was based on a couple of months of data gathering by three of the authors at DSNP, and on Giesen's (1987) ecological monograph.

- the Malay were avid fisherfolk, suggesting a need to know which fish they caught, and which ones supplied them with the most income and food.
- the Iban collected a number of non-timber forest products, suggesting the need to know the repertoire of useful NTFPs in the area—in both flooded (primarily Malay) and hilly (primarily Iban) areas.
- Agriculture was obviously important for the Iban, but little was known beyond the simple observation that it was a swidden system. What were their crops and how dependent were they on agriculture for food and cash? What about agriculture among the Malay, whose agricultural activities would have a more direct effect on DSNP?
- Local interest in income generation seemed probable, but how dependent were these groups on cash income? Determining both what they were doing to make money, and just how poor they really were, had important management implications.
- Finally, documenting people's eating behavior would grant a better understanding of which plants and animals were really crucial to human well-being in the area, and which ones they might be persuaded to stop harvesting (all within the Wildlife Reserve; and endangered ones outside it).

More importantly, perhaps, the results could be used while the study was in progress, to plan additional activities and to keep the project "on track." It also served the function of beginning to integrate project activities with those of the local people, and vice versa.

The search for this range of information was motivated by the conviction that understanding existing forest and other resource uses would enhance cooperation and effective collaborative management with local people. Such knowledge and cooperation would prove valuable in trying to change any harmful practices and in promoting traditional practices with conservative effects.

Study Sites

Because this chapter appears with a great deal of other research on the area, Very little introductory information about locale, beyond the introduction of main study

villages,[1] is presented here. Ng. Kedebu' is a small Malay fishing community of 108 people (Colfer's *de jure* census, 1992) in the heart of the DSNP (see Figure 1). It claims an area of 70.54 km^2, including a protected area (Hutan Nung) shared with other communities (Dennis *et al.* 1998). Its inhabitants are formally registered as residents of the larger community, Selimbau, on the Kapuas River, from which there is a yearly inundation of additional fishers during the dry season (raising the *de facto* population in October 1992, to 199). They are Muslims, sharing significant common cultural features with related peoples described by Firth (1966), Harrisson (1970), Furukawa (1994), and Scott (1985). Based on time series, remote sensing data (1973, 1990 and 1994), Dennis *et al.* (1998) concluded that local management of forest resources appeared to be sustainable (minimal change in forest cover);[2] their fisheries management, less so (see Dudley, this volume).

Wong Garai is an Iban longhouse to the northeast of DSNP. Its inhabitants have resided in the area for over one hundred and fifty years. Within a traditionally-defined territory of around 24 km^2, they practice a complex agroforestry system based on swidden rice cultivation, forest gardens, hunting, fishing, and wages earned on trips across the border to Malaysia (described in detail in Wadley 1997a, 1997b, n.d.a; Wadley *et al.* 1997, n.d.; Colfer *et al.* 1997a). Their belief system includes a mixture of Christianity and traditional ancestor worship (Wadley n.d.b), and they share many characteristics with other Iban and Ibanic groups (as described by Freeman 1970; Padoch 1982; Sutlive 1988; Dove 1981; Drake 1982).

Bemban, site of a partial study, is an Iban longhouse of 15 households, including 71 people (village records, 1992) on the western edge of DSNP. Its territory comprises 67.28 km^2 (Dennis *et al.* 1998), and is adjacent to the lakes, making the community's resource use somewhat more similar to the Malay patterns than are the other Iban communities. Half of the community is Protestant, half Catholic, all with a considerable animist admixture.

Comparable remote sensing data are unavailable for Wong Garai, but their system includes rotating of fields with long forest fallows (see Colfer *et al.* 1997a; Wadley n.d.a). Bemban has a similar system. The ecologist, Peters (1993) comments, "All factors considered, the [Bemban] system comes very close to the ideal of sustainable forest utilization." (p. 35). The remote sensing data from Bemban (Dennis *et al.* 1998) suggest more forest change there than in Wong Garai, but the shifting patterns of forest type over the years (1974, 1990, and 1994) suggest a normal long rotation forest fallow system, with probable sustainability under recent conditions.[3]

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[1]We use pseudonyms throughout this chapter in order to protect the privacy and trust of the people whose lives we studied.

[2]Dudley points out, as counter-evidence, the increasing scarcity of *tembesu'* (*Fragraea fragrans*), the most popular local building material, and the presence of many large stumps throughout the area (an undetermined number deriving from previous authorized, large scale logging in the area). He acknowledges that much of the forest remains, but questions why, feeling that low demand, lack of valuable timber, and regular flooding are more important factors than good management.

[3]There is some evidence that with the current Indonesian financial problems, these conditions may worsen. There is renewed interest in establishing a huge 47,000 ha oil

Methods

This study was conducted in Ng. Kedebu' and Wong Garai, and briefly in Bemban. In Ng. Kedebu', 8 to 10 families (20% of households) kept records; in Bemban, eight families (67%); and in Wong Garai, the entire longhouse of 13 families (100%). Each recordkeeping component (Fishing, Agriculture/ Agroforests, Forest Products, Wage Labor, and Food Consumption) had its own forms in the appropriate language: Malay or Iban.

Families filled in forms in booklets with multiple sheets for each month of the studies. Literate members of participating families recorded what their members caught, found, produced, sold, and ate, as fully as possible. If possible, they also specified producer, harvester, owner, and seller. They kept records every day for one month every quarter[4] resulting in four months of data during 1992-93, from Ng. Kedebu' and Wong Garai, and one month (December 1992) from Bemban.

In Ng. Kedebu', Colfer began the study and later supervised a village assistant, Sahar, after he took a lead role in monitoring the recordkeeping. Colfer resided there from August—October 1992; in a distant DSNP community from November 1992—February 1993; and at the DSNP headquarters, a short canoe ride from Ng. Kedebu', from March—July 1993. An attempt was made to reflect the limited community diversity by selecting half the respondents from "upriver" newcomers and half from "downriver" oldtimers, and by including one woman-headed household and one riverboat dweller. There was a slight change in cooperators over the year.

In Wong Garai, recordkeeping forms were modified by using the Iban language and adding a form on rice cultivation for use during the February rice harvest (See Colfer *et al.* 1993b; also Wadley 1997a for a fuller analysis of rice). This form included information on land use and ownership, and agricultural production. The entire community participated, under Wadley's resident supervision.

Colfer started supervising the study in Bemban but due to constraints on her time and low levels of literacy in the community, only one month of data collection was possible. The Wong Garai Iban forms were also used in Wong Garai.

Significant problems with the method included: difficulties finding sufficiently literate family members, people's fears about the confidentiality and use of the results, and difficulty reading people's handwriting, which became particularly acute during data entry.[5] This could be overcome by more regular supervision, which would also increase interaction with community members. Another difficulty was the rather amazing number of ways people measured things. As will be clear from the tables A-C and I-K, this problem was never satisfactorily resolved. A related problem was translation and

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palm plantation to the north of DSNP, and a transmigration settlement is apparently proceeding to the northeast as well as smaller oil palm projects along the middle and lower Leboyan river (see Wadley 1998).

[4]We paid participating families a nominal Rp. 15,000 per month for this work; this was roughly US$7.50 at the exchange rate of the time, US$1 = Rp. 2,000.

[5]This handwriting problem was compounded by language barriers as those who entered the data were from Java and unfamiliar with Malay and Iban. This resulted in numerous errors which we could only correct by returning to the original forms.

comparison of different Iban and Malay resource categories, particularly regarding forest use (see discussion on Agriculture/Agroforests and Forest Products below).

Results of Recordkeeping

Fishing

Fish and Fishing Gear

Many types of fish were recorded by local people (Appendices A-C). But it is important to note that their list by no means includes all fish species in these waters (cf. Dudley, this volume; Widjanarti 1995, for biological studies of local fish), but rather indicates those fish that local people consider important in their daily lives. There are inevitably some inconsistencies in identification of fish by local people (as well as some difficulty in linking common names to scientific names). However, these data, imperfect as they are, indicate the variety of fish people recognize and use, as well as the relative abundance of useful species.

Because project activities emphasized work in the park's lakes area, work to match scientific with Malay fish names has proceeded further than with Iban fish names. (Appendices A-C). It is almost certain that many of the same species recorded in the Malay data set are also in the Iban data set, but this match to local names has not yet been made. Nevertheless, species habitat preferences result in real differences between the fish fauna in the two areas. The Iban fish names are included to show the depth of indigenous knowledge of fish among that group and the comparative abundance of species, leaving for future researchers the task of matching the local and scientific names.

Differences between Iban and Malay emphases on fishing are related to the very different environments they inhabit. On one hand, Malay live in the lakes area which has been an extremely rich fishery for much of the year, while the Wong Garai Iban live in the headwaters of a Leboyan tributary. The people of Wong Garai have complained of increased fishing by communities downriver from them which they believe have decreased local yields. These factors no doubt contribute to some of the differences between Ng. Kedebu' and Wong Garai.

The lists of fish caught also show the significant differences in *amount* of fish caught in the three communities. Analysis of fishing records was complicated significantly by the fact that some fish were recorded by "tail" (*ekor* in Malay, *iko'* in Iban, which refers to counts of individual fish) and some were recorded by kilogram (Appendices A-C). Ng. Kedebu' average total catches reported in kg were more than seven times those recorded in Wong Garai, and more than twice Bemban catches. The dominance of Ng. Kedebu' in fisheries was even more pronounced in the comparisons by "tails."

Malay fisherfolk are much more likely than Iban swidden cultivators to be comfortable making estimates in kilograms, because many Malay commercial transactions require sale by kg. There is considerably greater fishing success among the people of Ng. Kedebu', where they of course also put considerably greater effort into such activities.

The three communities employed a variety of gear to catch fish (Table 1). These data are important because of the varying efficiency of different fishing gear and their consequent potential impact on fish stocks. Again, the frequencies show the different importance and methods of fishing among the Malay *vis-à-vis* the Iban. Although 60% of the cases of gear use among the Iban coincided with Malay gear, five of the twelve Iban

methods were not mentioned by the Malay. The Malay identify at least 45 fishing gear types (Dudley 1996b) but recorded only 13 gear types (ignoring the unknown methods recorded by both ethnic groups).

Table 1. Frequencies of Fishing Gear/Methods Recorded in Ng. Kedebu', Wong Garai and Bemban, 1992-93.

Gear/Methods	Ng. Kedebu'		Wong Garai		Bemban	
	Freq.	%	Freq.	%	Freq.	%
Gillnet	1612	61.3	56	9.5	3	5.1
Flat liftnet	444	16.9				
Castnet	267	10.2	33	5.6		
Small trap	81	3.1				
Multiple hooks/long lines	59	2.2				
Individual hooks	59	2.2	40	6.8	4	6.8
Large meshed gillnet	41	1.6				
Speargun/diving	18	0.7	125	21.3		
Tube trap	15	0.6				
Larger trap	9	0.3				
Longline	7	0.3				
By hand	1	< 0.1	7	1.2		
Fish trap			191	32.5	48	81.4
Wide mesh basket			110	18.7		
Poison			11	1.9		
Bush knife			9	1.5		
Unknown	16	0.6	6	1.0	4	6.8
Total	**2629**	**100.0**	**588**	**100.0**	**59**	**100.0**

The fishing implements used by the Wong Garai Iban reflect their reliance on fast-moving streams and small rivers. The small number recorded in Bemban is due in part to the fact that the recordkeeping study only encompassed the month of December.

Despite the Iban reputation for using poisons in fishing, these data (supplemented by Wadley's long term, day to day exposure to life in Wong Garai) suggest limited use of natural poisons in fishing by these communities. Where commercial interests come into play poison may be more likely to be used (see Aglionby 1995).

Fish and Money

Ng. Kedebu' is comparatively more dependent on income derived from fish than the Iban communities (Table 2).

Table 2. Income from Most Valuable Fish Sold in Ng. Kedebu' and Bemban.

Local Names	Latin Names [Probable]	Total Money (Rp) Received During 4 mo.	
		Ng. Kedebu'	Bemban
Bilis	*Clupeichthys bleekeri*	**1,444,270**	
Lais [various kind]			
• Lais		1,004,450	
• Lais butu	*Ompok hypophthalmus*	133,500	
• Lais p		2,500	
• Lais banga	*Kryptopterus micronema*	81,500	
• Lais jungang	*Kryptopterus apogon*	2,500	
Total Lais		**1,224,450**	
Patik/Baung			
• Patik	*Mystus nemurus*	860,395	
• Baung	*Mystus planiceps*	96,350	
Total Patik/Baung		**1,053,095**	
Toman [various kinds]	*Channa spp.*		
• Toman	*Channa micropeltes*	178,600	
• Delak	*Channa striata*	71,400	
• Piyang	*Channa marulioides*	500	
Total Toman		**250,500**	
Lelabi	Soft shelled turtles		**176,400**
Ulang uli	*Botia macracanthus*	**176,225**	
Umpan	*Puntioplites wandersii*	**86,350**	
Other fish		**531,245**	
Total		**4,766,135**	**176,400**

Note: No fish were sold from Wong Garai.

The variety of valuable fish and the amount of selling evident in Ng. Kedebu' is in obvious contrast to the pattern in Wong Garai (where no fish were sold) and Bemban, where only the very valuable soft-shelled aquatic turtle was exported for a very good price, across the Malaysian border. This fairly large amount of money (Rp. 176,400) was obtained by one man from the sale of one or two large turtles.[6]

[6]In late 1993, Wadley recorded from only one of many such transactions in Lanjak, a boat-load of 111 hard-shelled turtles (*buko'* or *biuku'*)—1,191 kg. total—and nine soft-shelled turtles (*lelabi*)—87.5 kg. total. They sold for Rp. 800 per kg. and Rp. 2,750 per kg. respectively. A Nanga Badau merchant bought them for further marketing into Sarawak, where turtles are reportedly sold as far away as Miri at very good profit (Wadley 1998). The Iban who had caught the turtles (and bought some from others) came from a longhouse on the eastern edge of the Reserve. So, like the Malay, Iban living within easy access of the Lakes also rely on them to make money.

Fish as a contribution to normal family incomes is only important in Ng. Kedebu', where fishing forms the economic base for all families. Table 3 shows the monthly incomes from fishing by study families in Ng. Kedebu'. The wild fluctuations are clear, as is the low overall average income from fishing (See Figures 5 and 6, for the place of fishing in overall income).

One important point concerning the Bemban data is that they come from December, a month of typically high water, when people normally do not fish much. Given their proximity to the Lakes, Bemban fishing and income derived from fishing are likely to increase in the dry months. This is in contrast to the upriver Wong Garai Iban, who fish for household consumption only—reflected in their absence in these data.

Table 3. Average cash received from fishing by family and month in Ng. Kedebu' (1992-93).

Family	Month				
	September 1992	December 1992	March 1993	June 1993	Family Average (Rp)
C	109,400	112,035	381,000	91,750	173,546
H	49,400	37,200	120,350	124,540	82,873
L	16,170	1,200	9,000	59,900	21,568
M	NA	82,000	305,900	186,050	191,317
J	NA	123,375	120,550	54,850	99,592
F	NA	0	45,350	0	15,117
N	14,150	5,475	31,500	NA	17,042
E	NA	NA	192,150	163,500	177,825
G	NA	NA	157,850	169,145	163,498
D	53,650	NA	NA	NA	53,650
O	0	NA	NA	NA	0
B	0	NA	NA	NA	0
Q	0	NA	NA	NA	0
I	NA	35,645	NA	NA	35,645
P	NA	NA	713,100	NA	713,100
K	NA	NA	NA	992,200	992,200
A	NA	NA	NA	207,750	207,750
Month average	30,346	49,616	207,675	204,969	173,219

NA refers to months when that family was not included in the study.

The average monthly income from fishing is about Rp. 175,000, reasonably substantial for rural forest dwellers in Kalimantan. The problem for local people arises from the rather extreme variations in income. DSNP fisherfolk live with a high degree of uncertainty. Sometimes they catch fish of high value or in large quantities, while at other times they catch or are able to sell nothing. In addition to the perversities (from the human perspective) of fish reproduction and movements, there are uncertainties related to transport. During the dry season, trade boats have difficulty getting to many

communities, thus sometimes interfering with the sale of fish when fish are most easily caught.

In Ng. Kedebu', the average cash received per trip is Rp. 1800. In Wong Garai, it is nothing, and in Bemban it is Rp. 3000 (statistically significant differences, using Kruskall-Wallis nonparametric test, $\chi^2 = 49.09$ with 2 d.f. ($P < 0.001$). This yields an overall average of Rp. 1,800/trip. The fisheries related income in Ng. Kedebu', the lack of fisheries-related income in Wong Garai, and the dramatic (but more occasional) fisheries-related income in Bemban reflect local patterns of resource use. Malay rely for a low, marginal income, on fisheries. Iban experience occasional, windfall profits from fisheries, but they do not rely on fish for primary subsistence needs (except as part of one's own diet, see last "Results" section; also Wadley 1997a).

Ng. Kedebu', as the only location with recurring income from fisheries, provides the only opportunity to examine income data, disaggregated by gender. There, males earn an average of Rp. 1,500/trip and females, Rp. 1,200/trip, with mixed outings yielding an average of Rp. 3,900/trip. The overall average income per trip is Rp. 1,800. The lower female earnings may relate to their tendency to "fish for supper." The higher earnings for mixed groups cannot be disaggregated from the fact that a mixed group is, by definition, more than one person, where a single sex trip is often a single fisher. The amount of cash received by mixed gender groups is significantly greater than that received by single sex outings, whether male or female (Kruskall-Wallis nonparametric test, $\chi^2 = 100.2$ with 2 df, $P < 0.00$).

Level of effort

One simple indicator of level of efforts is the number of fishing trips undertaken. Tables 4 and 5 show these, disaggregated by gender, for Ng. Kedebu' and Wong Garai, respectively.

Table 4. Number of Trips by Gender and Month—Ng. Kedebu' (1992-93).

Gender	Month							
	September 1992		December 1992		March 1993		June 1993	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Male	156	63.1 %	377	70.3 %	710	72.5 %	649	76.1 %
Female	49	19.4 %	89	16.6 %	231	23.6 %	0	0 %
Mixed	44	17.5 %	70	13.1 %	38	3.9 %	204	23.9 %

$\chi^2 = 333.2$ with 6 df, $P < 001$.

Table 5. Number of Trips by Gender and Month—Wong Garai (1992-93).

Gender	Month							
	December 1992		March 1993		June 1993		September 1993	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Male	81	76.4 %	135	75.0 %	151	100. 0%	151	100.0%
Female	25	23.6 %	45	25.0 %	0	0 %	0	0 %

$\chi^2 = 84.0$ with 3 df, $P < 0.001$.

In both Iban and Malay data sets, there is no statistically significant difference in length of trips by men and women, but among the Malay trips involving males and females together were significantly longer than single-sex ones.

Bemban is excluded from this comparison because the sample was too small. For the Malay, the predominance of mixed gender trips in June, a comparatively busy fishing season, is striking when contrasted with the other months, in which single-sex outings are more common. An increase in fishing by both genders during the dry season (typically June-August) was also demonstrated in a time allocation study conducted in Ng. Kedebu' (Colfer *et al.* forthcoming).

Among the Iban, the greater involvement of men in fishing contrasts with the greater involvement of women in subsistence agriculture (see Wadley 1997a). On the one hand, men fish more in the months when they must get fresh food to feed guests during post-harvest rituals (June) and after rice planting, their peak agricultural labor (September). Women, on the other hand, who are overwhelmingly more involved in rice cultivation, thus have less time for fishing. The months where there is no recorded female fishing reflect periods when women are busy preparing and attending post-harvest rituals (June) as well as weeding hill swiddens and planting swamp swiddens (September).

The much higher number of trips among the Malay also provides further confirmation that fishing is a major economic activity among these people. The larger number of trips undertaken in Ng. Kedebu' *vis-a-vis* Wong Garai is statistically significant ($\chi^2 = 55.69$ with 2 d.f., $P < 0.001$).

The amount of time consumed in fishing differed significantly by community as well. In Ng. Kedebu' the mean number of hours per trip was 4.88; in Wong Garai, 1.64, and in Bemban, 1.51. Fishing trips made in Ng. Kedebu' are significantly longer than trips in the other two locations (Kruskall-Wallis nonparametric test, $\chi^2 = 803.43$ with 2 d.f. ($P < 0.001$).

A number of other researchers have noted the active involvement of women in Indonesia's inland fisheries (e.g., Upton and Susilowanti 1992; Pollnac and Malvestuto 1992; Malvestuto 1989; C. Bailey *et al.* 1990; Colfer *et al.* forthcoming). These data confirm such involvement, though to a statistically significant lesser degree than male involvement (Tables 4 and 5).

Malay spend more time fishing, and they have access to much denser (seasonal) populations of fish. In all probability, Bemban patterns, were data available, would more closely parallel the Malay during the dry months.

Fisheries and Management Issues

- Which fish are most commonly caught? Does this reflect abundance in the Reserve? What sorts of management considerations are needed to safeguard these fish, from both biodiversity and production points of view?
- How much fish do the various communities actually catch?
- What are the management implications of these kinds and amounts of gear? Are they likely to result in serious resource degradation? What regulatory regimes would best safeguard the fish while maintaining the people's livelihoods?

- Which fish are most important economically? Are these fish abundant in the area? How can we make sure they remain abundant? If they are abundant, how can we enhance the profitability of their use to local people?
- How do people's incomes vary over the course of the year? What is their standard of living, as measured by incomes? What management actions are feasible, given this level of income for local people?
- How do the different communities differ in their incomes from fishing? What sorts of management differentiation will these differences imply?
- Who fishes and who receives the cash from fishing? How do we ensure that those who benefit now from fishing do not lose out under new management regulations?
- How does the distribution of fishing effort by gender and ethnicity differ over the course of the year?
- How much time do people spend fishing? How does this differ among the different communities?

Agriculture/Agroforestry

Almost as obvious as the Malay dependence on fisheries is the Iban dependence on agriculture. Their economic base is rice cultivation (*cf.* Wadley 1997a; Colfer *et al.* 1993b). Although Iban cultural, economic, and ritual dependence on rice is essential to understand, it is not a monocrop system. Instead rice cultivation is part of a larger agroforestry system. Rice fields themselves are really multicrop gardens with rice as the principal crop.

During data collection, an attempt was made to provide comparable categories for Malay and Iban. In doing so, Iban field, garden, and managed forest categories were collapsed into a broader category of "things that are tended or cultivated" (*utai ke dipara*). Thus in these data there are a number of products that might best be placed in the forest products section, and indeed there is considerable overlap with that section (see below). This shows that a neat division of cultivation and forest is a rather foreign concept to Iban, and results in the cumbersome category of "agriculture/agroforestry" used here.

Crops Harvested

Comparing Iban rice fields and gardens to Malay gardens in the field, the greater diversity of crops is obvious at Wong Garai. In this data set, Wong Garai collaborators recorded 21 items, and Ng. Kedebu', 17 (Appendices D and E). Add to this, products from Iban agroforests (including the animals captured in agroforests and uncultivated plants collected), and Iban "crop" diversity is far higher.

For the Malay data, the Latin names were not determined on the basis of identified samples but rather on the basis of the best estimates of botanically trained fieldworkers in the Reserve. For the Wong Garai data, the Latin names were determined from the extensive ethnobotanical work of Hanne Christensen (n.d.b) at a closely related longhouse just across the border in Sarawak. The animals captured were identified by Wadley in the field.

In Bemban, in December, people reported a preponderance of corn, cucumbers and cassava. These are crops normally available at that time of the agricultural cycle.

Crop Locations

The diversity of crop locations is among the Iban is in striking contrast to the Malay agricultural system. In Ng. Kedebu' only one source was listed, the *tayak*, or small fields located directly behind the village. Colfer measured a sample of nine (of 45) fields, and they ranged in size from 24 m^2 to 297 m^2, with the mean being 117 m^2. These fields were flooded most of the year, and the ability to bring a crop to fruition was greatly influenced by the timing of the annual flood. Table 6 shows the Wong Garai locations from which people harvested crops or collected/captured agroforest products. The much more complex agroforestry system of the Iban is reflected in the variety of locations listed below.

Table 6. Sources of Agricultural/Agroforest Products, Wong Garai, 1992-93.

English Names	Iban Names	Frequency	Percentage
Homegarden	Kebun/Redas	142	33.6
Forest reserve	Pulau	95	22.5
Old longhouse site	Tembawai	74	17.5
Floodplain	Emperan	63	14.9
Hill rice field	Umai bukit	21	5.0
Newly fallowed field	Temuda	11	2.6
Longhouse yard	Laman	7	1.7
Forest cemetery	Pendam	4	0.9
Fallow forest	Damun	3	0.7
Rubber grove	Kebun getah	1	0.2
Swamp rice field	Umai paya'	1	0.2

Harvesting, Ownership and Gender

Besides crops and locations, the division of labor by sex in these two communities had potential management implications. Participating households recorded who harvested the crops recorded, shown in Table 7. The predominance of women harvesters is evident in both communities, though much more dramatically so in Ng. Kedebu'.

Table 7. Gender of Harvester in Ng. Kedebu', Wong Garai and Bemban, 1992-1993.

Gender	Villages						
	Ng. Kedebu'		Wong Garai		Bemban		Total
	Freq	N	Freq	N	Freq	N	
Male	42	18.0 %	159	37.7 %	7	7.4 %	208
Female	190	81.6 %	230	54.5 %	35	37.2 %	455
Mixed	0	0	23	5.5 %	51	54.3 %	74
Unspecified	1	0.4 %	10	2.4 %	1	1.1%	12
Total	233	100 %	422	100 %	94	100 %	749

$\chi^2 = 281.9$ with 4 d.f ($P < 0.001$), there is a different gender pattern among three villages.
In this table 12 observations are missing.

There is a significantly different gender pattern among the three villages. In Ng. Kedebu', women are very dominant, probably because of their emphasis on *tayak* cultivation. In contrast, among the Iban, men's and women's contributions are more evenly spread although women still dominate. Men's involvement in agroforest management is relevant here.

Given the importance of tenure considerations to sustainable forest management (e.g., Prabhu *et al.* 1996; Colfer *et al.* 1997b), recorders were asked to indicate who owned the land from which the crops were harvested.

Table 8. Gender of Land Owners from Which Crops were Harvested, Ng. Kedebu' and Wong Garai, 1992-93.

Gender	Ng. Kedebu'		Wong Garai	
	(N)	(%)	(N)	(%)
Female	230	98.7	28	6.6
Male	1	0.4	118	28
Mixed gender	2	0.9	182	43.1
Unspecified	0	0	94	22.3
Totals	**233**	**100**	**422**	**100**

In Ng. Kedebu', women were the primary land owners (though the land owned covers a remarkably small area),[7] (Table 8). In Wong Garai, the pattern shifts, from one slightly dominated by women to one where mixed gender ownership is predominant, with males having a significantly greater part in land ownership than women. The "unspecified" category is also likely to be mixed gender; it refers to "same household" and "kin in another household."

This pattern at Wong Garai is probably a product of the prevailing patrilocal residence, whereby a woman goes to live with her husband's family upon marriage. Consequently, men are more likely to be regarded as the formal heads of households and thus more likely to be listed as land owners. However, this oversimplifies the matter because among the Iban, households own land, not individuals (Wadley 1997a, 1997b).

Furthermore, in many areas of Borneo, crops can be owned on land belonging to someone else. Participants in the study therefore also indicated who owned the crops that were harvested (a separate issue from land ownership, in many cases). In Ng. Kedebu', the land owner and the crop owner were in all cases identical, i.e., women own the plants as well as the land.

This was not the case in Wong Garai where the largest category of plant ownership (almost 40%) came from land belonging to the unspecified category (i.e., "same household" or "kin in another household"). Women were the second largest category of plant owner (29%). Men were the least likely to own the plants (13%), in contrast to their more meaningful position in land ownership (28%). This represents evidence for local acceptance of the idea that allocating one's labor confers rights (sometimes called "sweat equity")—a commonly stated view in Borneo and other areas of Indonesia.

[7]Dennis *et al.* (1998) found a total of only 31 ha of cleared forest in their total territory of 7,054 ha, based on 1994 remote sensing data. The cultivated area behind the village was not more than 5 ha in 1992.

Again, however, for the Iban this conflates notions of ownership. Women are listed as "owners" for two reasons: (1) They were more likely to have planted the items in question, and (2) with high rates of male absence due to labor migration, women might have been listed as owning something because they were the effective household heads. The predominance of mixed gender (including "unspecified") shows that gender is not a particularly important ownership issue in Iban households.

This pattern with women or mixed categories dominating suggests that efforts by conservation area managers to intensify agriculture, improve fallow management, or develop income generation projects related to agroforestry would do well to include local women. In the DSNP context, approaching formal male leaders is an important prelude to cooperation with communities. However, once such cooperation has been secured, planning, implementation and evaluation will need to involve women as well (cf. Colfer *et al.* 1997c). The complete dominance of women in Ng. Kedebu' agriculture makes it particularly important there. The wider distribution of responsibilities among the Iban suggests that both need to be involved, although women do dominate in rice cultivation (cf. Wadley 1997a).

Agriculture/Agroforestry and Management Issues

- What agroforestry products do the people in these communities grow and collect? In what quantities?
- Where do local people gather and grow these products? What management strategies might be useful in intensifying existing land uses, such as through fallow improvement in order to minimize expansion of agricultural areas?
- Who grows and collects these products? Who would be appropriate partners in efforts to improve or experiment with new management techniques?
- Whose permission will be needed to experiment with new management techniques on village lands?

Forest Products

The forest product portion of the recordkeeping study prompts some conclusions about people's dependence on the forest, forest culture interaction, and indigenous knowledge—all issues of relevance for sustainability (Colfer 1995).

Four issues emerge as important from this portion of the study:

1. The repertoire of items that were collected by people in the three communities. This indicates existing patterns of use, probable areas of indigenous knowledge, and hints about potential for expansion or need for reduction in harvesting.
2. The uses to which those items were put. If a large number of items was necessary for subsistence (food, fuel, building materials, etc.), this would suggest a strong dependence of local people on the forest. It could also, less directly, reflect indigenous knowledge of forest products usage, including possibly environmentally benign areas for income generation.

3. The locations from which the items were collected. The number of locations mentioned can provide an indication of the people's indigenous geographical knowledge—and provide useful hints to their use of space within the park.
4. The income derived from these products. This would reflect people's dependence on forests for cash, either as part of subsistence or as supplementary income.

Repertoire of Forest Products

A variety of forest products are collected throughout the year in each of the three communities (Appendices F-H). The Wong Garai data set (Appendix G) is much more extensive than either of the other two, reflecting greater Iban forest use than Malay forest use; and also the longer research period, *vis-à-vis* Bemban (Appendix H). Again, as with the data on agriculture/agroforests, there is some overlap here with "cultivated" categories.

Although the Bemban data set is not comparable (because of the reduced period of time for which records were kept), the Bemban Iban represent an intermediate category. This is not surprising but nonetheless interesting because their community is located much closer to the Lakes than Wong Garai. One might therefore expect Bemban forest use to take an intermediate position between the Wong Garai forest use patterns and those of Ng. Kedebu'.

The data reveal a rather sharp (and not surprising) division between the pattern of forest use of the Malay, on the one hand, and the Iban, on the other. The 207 forest products recorded by the Malay were exclusively wood and rattan (with one exception). The Iban of Wong Garai, in sharp contrast, recorded primarily foods (556 items), with a few other forest products (60).

Our attempts to determine amounts of forest products collected have been somewhat confusing primarily because of the different "counters" (or units) used for different kinds of item (appendices I-K). The Malay recorded the fewest ways of measuring quantities of forest products (Appendix I), with three (sticks, canoesful, and sheets) standards.

A greater number of measurements for forest produce (eight) were used, as well as a greater variety of products collected from the forests of Wong Garai. The terms used to count items collected are stick (*batang*), seed (*igi'*), bundle (*tungkus*), tail (*iko'*), backpack (*ladong*), sheet (*keping*), basket (*raga'*), and stem (*tangkai*) (Appendix J).

The products, the amounts regularly used in all three communities, and the effort required (measured as number of trips) to search for them, varies between the communities.

Uses of Forest Products

The uses for these forest products were also recorded. In Ng. Kedebu' people use forest products in three primary ways—as firewood (24.5%), for smoking fish (33.2%), and for sale (27.4%). In Bemban they use forest products for making mats (35.0%), boat construction (22.5%), and food (15.0%). In Wong Garai people use forest products for eating (92.3%) and cooking (5.9%). The Malay use forest products commercially although also for subsistence purposes.

Among the Iban, forest products are primarily foods or items used in subsistence. This reflects the Iban tendency to take for granted the many forest products that they use daily. Colfer had difficulty obtaining comparable information on non-food uses of forest

products from a similar group (the Uma' Jalan Kenyah of East Kalimantan). This was simply because the local people could not conceive of someone a) not knowing about these products and their uses already, or b) having any particular interest in something so common. The items, not typically in short supply, were used daily by the people themselves (see Colfer *et al.* 1997a).[8]

Certainly Iban dependence on forest fibres, firewood, and timber is more obvious when one is confronted with their lifestyle (housing, cooking and agricultural implements, binding materials, weaving materials for mats and containers of various kinds, furniture, boats, etc.) than is evident from these data. Their extensive ecological knowledge and lexicon for forest resources further support this view (e.g. Colfer *et al.* 1997b; Wadley n.d.a; Christensen n.d.a; Pearce *et al.* 1987).

The Bemban data, though minimal, again reflect an intermediate position between Ng. Kedebu' and Wong Garai, in the comparative dominance of wood products collected. Besides firewood, foods, and construction materials, the people of Bemban collect forest products for ceremonies. Again, in all three villages, the subsistence uses (or commercial uses which are then immediately converted to subsistence uses) of—and thus dependence on—the forest are clear.

Locations from Which Forest Products were Collected

The final analysis on this data sub-set revolves around the areas in which people collect forest products (appendices L-N). The fact that Bemban's data set is smaller than the others derives from the fact that data were only collected for one month there. However, as with the other results, Bemban seems to represent an intermediate situation between Ng. Kedebu' and Wong Garai.

The Wong Garai data sets includes a large number of items in a small number of locations; whereas the Ng. Kedebu' dataset includes a smaller number of items in a larger number of named locations. There are several possible interpretations to this observation. First, the terrestrial homeland of the Wong Garai Iban (lowland Dipterocarp forests) is richer in terms of the repertoire of forest products than the flooded forest areas which the Malay inhabit.[9] The Malay may require a more refined geographical knowledge base—Where do we find the few products available, during what periods of the year?—compared to the greater botanical and zoological knowledge base required in the Iban context—Which of the many products are useful/edible?

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[8]One other factor here may involve the method and its implementation at Wong Garai. Most data recorders were schoolchildren of various ages (none younger than 10 years), and they were less likely to be involved in collection of non-edible forest products. In addition and given their diligence at recording meals, they may have placed an over-emphasis on food items compared to the other entries. On several occasions Wadley had to ask them why they had not recorded certain things (e.g. lengths of bamboo for cooking) when it was obvious that members of their households had collected them.

[9]Numerous researchers have commented on the relative poverty of these flooded forests in terms of flora and fauna (Giesen 1987, 1996). In his surveys in upland and lowland areas of this area, Peters (1993:7) found 133 species in the upland areas compared to only 44 species in the lowlands. Its "claim to fame" is uniqueness rather than abundance or diversity.

The most probable interpretation, however, is related to the codes used: Malay codes represent specific named locations while Iban codes refer to categories of places, which have many specific names. For example, within Wong Garai territory, there are 26 (named) old longhouse sites and over 46 (named) forest or tree reserves (including sacred sites) (see Colfer *et al.* 1997b).

This difference is probably researcher-derived. In trying to produce comparable categories in the data collection, the Malay category of forest (*hutan*) encompasses a range of Iban forest types (managed forest, preserved forest, and fallow forest), each of which has its own set of sub-categories. In asking the Iban to record forest products, this range of location types had to be identified on the forms in order for all types to be included. Another result of this effort was the considerable overlap in items between agriculture/agroforests and forest data sets (see above).

Income from Forest Products

One important issue conservation managers must understand in local contexts is the degree of market dependence among local people. Table 9 provides a clear indicator of the relative market involvement of the Malay and the Iban. Interestingly, the Malay often sell forest products in small amounts *vis-a-vis* the Iban who rarely sell forest products, but receive much larger amounts of money for them.

Table 9. Totals and Mean Money Received from Forest Products, Ng. Kedebu' and Wong Garai, 1992-93.

Villages	Total Rp. Received (Rp)	N	Mean Rp Received
Ng. Kedebu'	699,244	82	8,527
Wong Garai	330,950	17	19,500

(Here we have combined data from "forest" and "agroforest"sections.)

The sample families in Ng. Kedebu', taken together, earned Rp. 699,244 from the sale of forest products during the four recordkeeping months. This results in an average monthly income per family of Rp. 19,513 (Figure 5). Extrapolating from these data, one gets over Rp. 2,000,000 for a whole year for those families, or an estimated Rp. 10,500,000 village annual income from forest products.[10]

The Iban in Wong Garai, by contrast, recorded a total income from forest products of Rp. 330,950 (representing only 17 records of forest product sales, from seven households). Bemban families recorded no income from forest products, during the month they kept records. Both Iban and Malay are dependent on forest products for their livelihoods, but in very different ways.

Looking more closely at the Ng. Kedebu' data set, where money is a more pervasive element in people's lives, there is an interesting pattern, with one family having a much

[10]These estimates were computed by multiplying the per family income by three (to reflect the unrecorded remainder of the year) and then multiplied again based on the proportion of the community's households included in the studies. The figures, of course, must be taken with a grain of salt, since many local products are truly seasonal, i.e., only available during a short period—so even though we tried to reflect seasonal variation, by scheduling our recordkeeping every three months, in tropical rain forests this kind of estimate is less reliable than it would be in many contexts.

larger income than the others (Figure 2). Colfer also found this pattern in a similar study of Kenyah income patterns in Tanah Merah and Long Segar, East Kalimantan (Colfer *et al.* 1997a).

A slightly different pattern exists in Wong Garai, where seven of the thirteen families sold forest products and with one household making Rp. 92,950 from one sale of illipe nuts and another, Rp. 130,000 from three such sales.

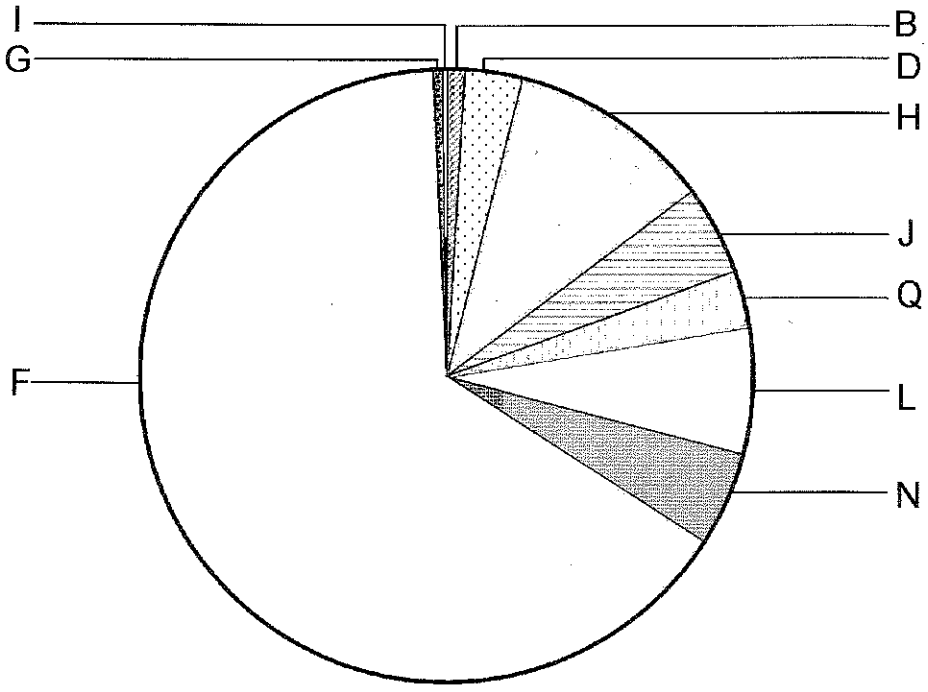

Figure 2: Division of village income from forest products by family, Ng.Kedebu' (1992-93).

There is a significant gender difference in the amount of income received for forest products in Ng. Kedebu' (Using Kruskall-Wallis nonparametric test, $\chi 2 = 7.41$ with 2 d.f ($P < 0.025$). There, men received an average of Rp. 8,100, while women only received an average of Rp. 3,600, with mixed gender outings averaging less than Rp. 1,000. The overall average income from these products was Rp. 6,300.

From the 17 records in Wong Garai, Iban women generate more cash from forest products than men. From only six records of selling illipe nuts, women earned Rp. 265,450—80% of the total earned and Rp. 44,000 for the average transaction. In contrast, men earned only Rp. 65,500 from the sale of rubber and palm wine; this was from 11 records of two households (only 20% of the total and only Rp. 5,900 for the average transaction).

Forest Products and Management Issues

- What products do the local forests provide for local people? How intense is this use? How might forest management be improved to protect biodiversity while accommodating local people's needs?
- What quantities of which forest products are being harvested? Is this putting a strain on biodiversity or on the resources? How might these products be better managed, or protected?
- Where are local people finding the forest products they use? Are there areas that are over-harvested? Are there special niches for particular forest products?
- How important are forest products to the people's livelihoods and to their cash incomes? What effect would reduction in access bring? Could we increase revenues through processing or improved marketing of the same amount of produce?
- Who gains the income from sale of forest products? How much income do forest products provide to men and women?

Wage Labor

Despite this source of income, people in all three communities are poor. The Malay are dependent on cash (from fishing, fish processing, and forest product collection) to buy their rice and other non-fish foods; and they are dependent on the forest to supply many of their daily subsistence needs (boats, houses, construction materials, etc.).

The Iban use less cash in daily life, though they may have access to more wealth than the Malay through remittances and goods brought back by the circular migrant men. Almost all of their food comes from the surrounding agroforests.

Conservation area managers have often devoted considerable effort to increasing incomes in conservation areas, as a means to enhance protection of local resources. Indeed, CIFOR has devoted one of its ten projects to trying to assess the truth of this widely held belief, in East Kalimantan. This issue was considered important enough to include in the recordkeeping study.

The jobs performed in Ng. Kedebu' included private chainsaw operator, carpenter, and fish processing (Table 10). One man served as a guide for the timber company (P.T. Mekanik) in transporting logs through the Reserve, another hired out himself and his canoe.

Wong Garai recordkeeping included very little wage labor. Of the three individuals recording any income from wage labor in Ng. Kedebu', two were outsiders who had come for the busy fishing season. All the recorded wage was from the months of September and October. The overall income recorded totaled Rp. 100,500. If extrapolated to the entire community of about 50 households, this would yield an annual village income from wage labor of roughly Rp. 1,500,000.

Five Ng. Kedebu' families reported earnings from fish processing (either sale of smoked, dried, or salted fish). The important fish are listed in Table 11, along with related income. The total fish processing income for the year for these five families was Rp. 315,050, which converts to an annual village income from this source of over Rp.

4,700,000[11]—considerably more important than wage labor, *per se,* which provided only Rp. 100,500 to four individuals.

Table 10. Kinds of work performed in Ng. Kedebu and Wong Garai, 1992-1993.

Work	Ng. Kedebu'		Wong Garai	
	Frequency	Percentage	Frequency	Percentage
Sale of dried fish	29	56.9	0	0
Carpenter	13	25.5	0	0
Sale of smoked fish	5	9.8	0	0
Operate boat (logging company)	2	3.9	0	0
Chainsaw operator	1	2.0	0	0
Escort/guide	1	2.0	1	12.5
Carry things	0	0	6	75.0
Logging fee	0	0	1	12.5

Table 11. Average kilograms, prices, and income from fish sale by month, Ng. Kedebu' (1992-93).*

Fish	September 1992			December 1992			March 1993		
	Kg.	Price	Income	Kg.	Price	Income	Kg.	Price	Income
Bilis	0	0	0	4.78	1362	6624	21.67	1267	26367
Lais	1.43	3625	6013	0	0	0	3.00	5167	15167
Landin	15.25	1000	15250	0	0	0	0	0	0
Patik	0	0	0	0	0	0	17	650	11050

* No fish sale from June 1993

No families recorded wage labor or fish processing income from Bemban. Although there is unquestionably income coming into this village from wage labor performed elsewhere, apparently none of the circular migrants returned during the period of recordkeeping. At Wong Garai, there were eight cases of locally-generated wage labor income—six cases of carrying lumber or other things, one case of escorting outsiders, and one of a village official receiving a fee of Rp. 36,000 from a local logging company (Table 10). The total income amounts to only Rp. 67,150 or Rp. 5,165 if averaged across households. Of the eight cases, three involved women while the majority (six) involved teenagers working for money primarily to pay for school supplies, though such money was also subject to use for other household expenses. Given the small amount of cash Iban appear to use for daily subsistence, the money earned here stands out as important.

[11]We get village total income during the periods of study by multiplying the total income that we got from survey by 5, to represent the sample of 20% of the community extrapolated to the whole community. Then we get the annual village income by multiply the village total income during the periods of study by 3 to represent the rest of the months that we extrapolated.

The income from wage labor is quite small, and even the fish processing income recorded in Ng. Kedebu' does not represent a particularly significant amount for an entire village. Ironically, the poverty of the people of Ng. Kedebu', who need cash every day for food and who do report some wage labor, is more observable than the poverty of the Iban, who recorded little involvement in wage labor, or income therefrom.

The explanation lies in regular circular labor migration to Malaysia and Brunei by Iban men. There they work in a range of jobs including logging and construction, and receive very high wages by Indonesian standards.[12] The average monthly wage ranges from US$170 to US$900, or Rp. 340,000 to Rp. 1,800,000 at early 1990s rates (US$1 = Rp. 2,000). The amounts of money men remit to their families range from around US$50 to US$600 (or Rp. 100,000-1,200,000) (see Wadley 1997a for a full analysis).

However, no remittances were ever recorded in these data, nor is there any record of men's wages when they returned (as we would expect in the June recordkeeping when men regularly come home to visit). These omissions may have two causes: (1) People are extremely reticent to discuss money matters, particularly how much money they actually might have. Wadley was unable to get complete information on income from circular labor migration because of this. (2) The data recorders may have fallen into the habit of writing down things collected and produced by resident household members. Because people become so accustomed to male absence, they might have thought non-resident production beyond the scope of the study.

Figs. 3-6 provide an overview of incomes. The people of Ng. Kedebu' are much more dependent for subsistence on cash incomes than are those of Wong Garai; and substantial additional, unrecorded cash is available in Wong Garai from remittances (Figures 3 and 4).

Figures 5 and 6 are pie charts, showing the distribution of sources of family cash income recorded in the two communities. These data do clearly show the importance of natural resources are very important to these people, and are used in very different ways by the two ethnic groups (Figures 5 and 6).

Wage Labor and Management Issues
• What kinds of wage labor are available in the area? How involved are local people in wage labor?
• How reliable and how profitable are fisheries related work in the Reserve? Are there ways to stabilize incomes, or to increase incomes, without increasing harvesting, through better marketing or improved processing methods?
• Who are the wage laborers in and around the Reserve? How common is wage work?
• What is the dependence of these people on cash incomes? What is the distribution of sources of income in the various study communities?

[12]Wadley (1997a) found that in areas where smallholdings of rubber or pepper were profitable (i.e., stable prices and close markets), the incidence of labor migration was lower than in Wong Garai.

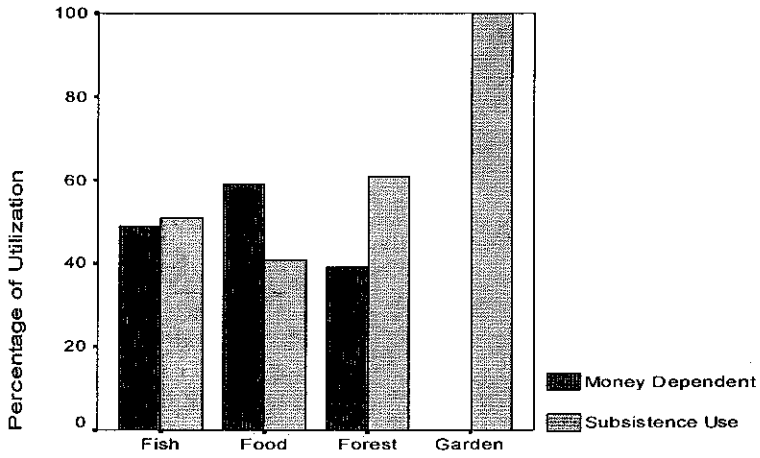

Figure 3. Percentages of recorded items sold (Fish, Forest and Garden Produce) or bought (Food) vs. subsistence in Ng. Kedebu', 1992-1993.

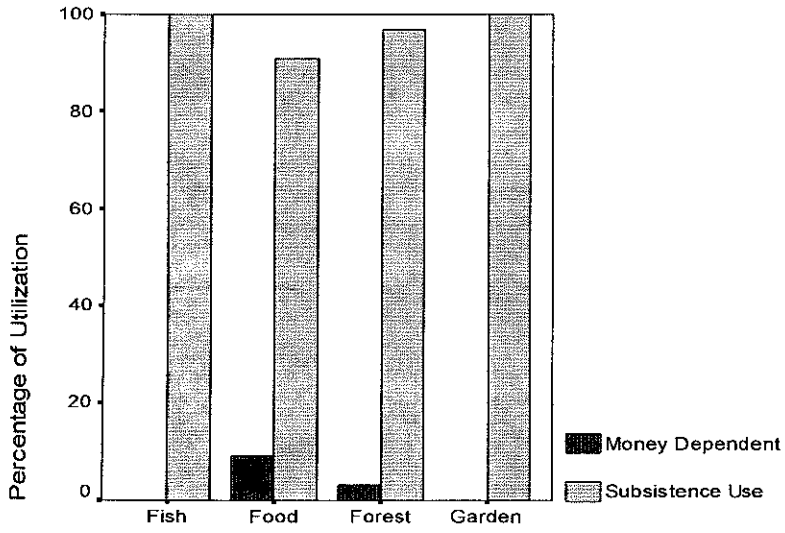

Figure 4. Percentages of recorded items sold (Fish, Forest and Garden Produce) and bought (Food) vs. subsistence in Wong Garai, 1992-1993.

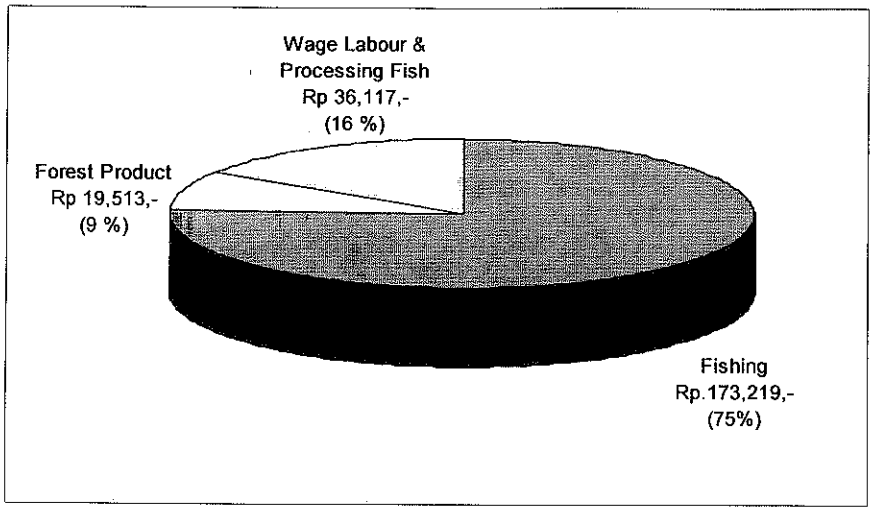

Figure 5. Pie chart showing the percentages of average monthly income per family from various sources in Ng. Kedebu' (Rp 228,849) during the study periods.

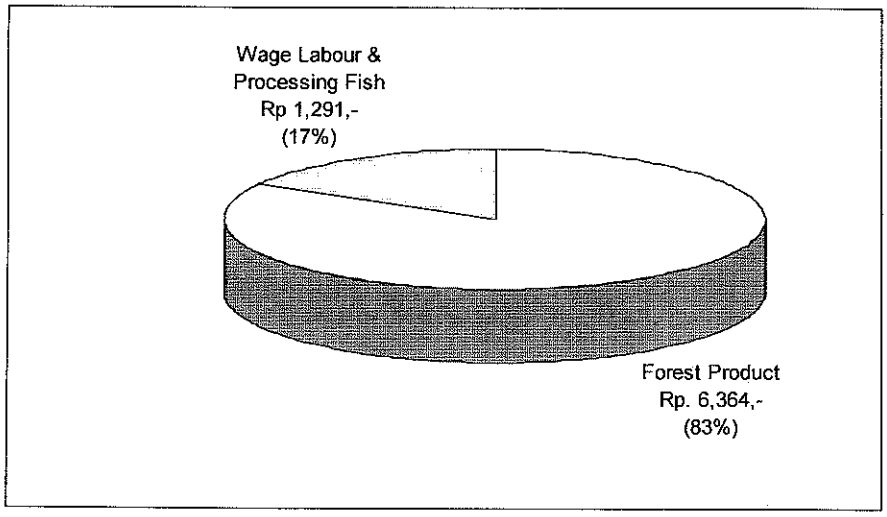

Figure 6. Pie chart showing the percentages of average monthly income per family from various sources in Wong Garai (Rp 7,655) during the study periods.

Foods

The people of Danau Sentarum are poor by most outside standards. It is therefore especially important to be able to assess and monitor their nutritional situation. Food consumption recordkeeping gives a reasonably accurate portrayal of the kinds and distribution of foods available to people in the area. It also provides an indicator of people's dependence on local resources as well as hints on which local resources are critically important for subsistence.

Repertoire of Foods

Overall, there were 127 types of foods listed in the data set. The most striking feature is the dominance of rice in the local diet. Mentioned 4,511 times, 1,582 of them come from Ng. Kedebu' and the rest come from Wong Garai. The second most frequently mentioned food item was cassava leaves, with 648 occurrences—127 come from Ng. Kedebu' and the rest come from Wong Garai.

There was a significantly different pattern of food consumption between the Malay fisherfolk and the Iban swidden cultivators. This can be seen in Appendices O and P, which show the frequencies of foods consumed by month for each ethnic group. One important difference between the two ethnic groups is the Iban preference for eating three times a day, and the Malay tendency to eat only twice.

This kind of information is important in attempts to work with local people. If certain animals, for instance, form a critical part of local diets, forbidding people to hunt them may be unrealistic. On the other hand, extended protection of old growth forest may serve to maintain populations of forest pig, which is prized by Iban and is not illegal to hunt outside the Reserve (see Wadley *et. al.* 1997). Similarly if people's most basic food item, rice, is rooted in swidden cultivation, attempts by conservation managers to persuade people not to cut forest lands are unlikely to succeed (without very attractive incentives and alternatives). However, efforts to work with farmers to improve fallow management in order to sustain the economically and ritually important swiddens may be met with a good deal of interest.

Timing is another issue that influences management. Certain foods may be abundant at certain times of the year, whereas there may be times of scarcity as well. Among the Iban, for example, green leafy foods and vegetables are more common from October to December when those crops are ripe in the hill swiddens. Thereafter they are increasingly scarce until the next farming year (see Figure 8).

Nutritional Categories of foods

The distribution of foods among the different nutritional categories can give some hints (though not a definitive statement) about the nutritional status of local people. Again, there is a divergence of situations existing in Ng. Kedebu' and Wong Garai (Figures 7 and 8).

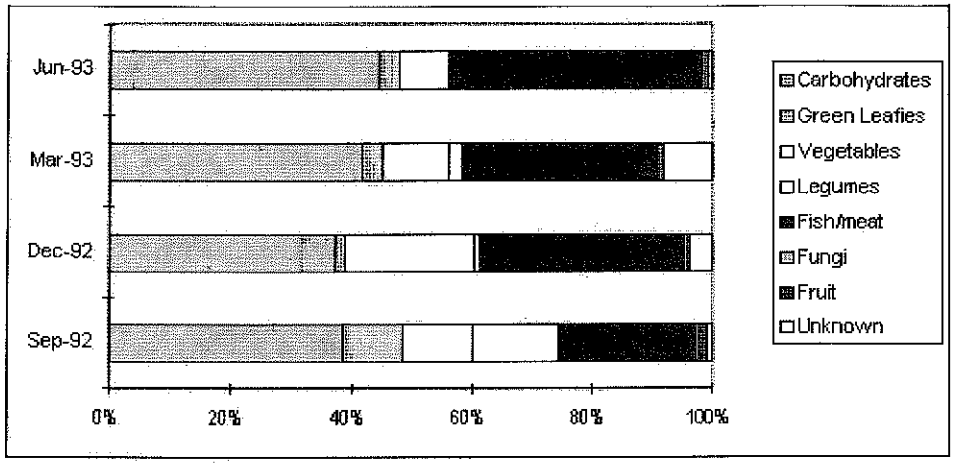

Figure 7. Nutritional Categories of Foods Consumed, Ng. Kedebu', 1992-93.

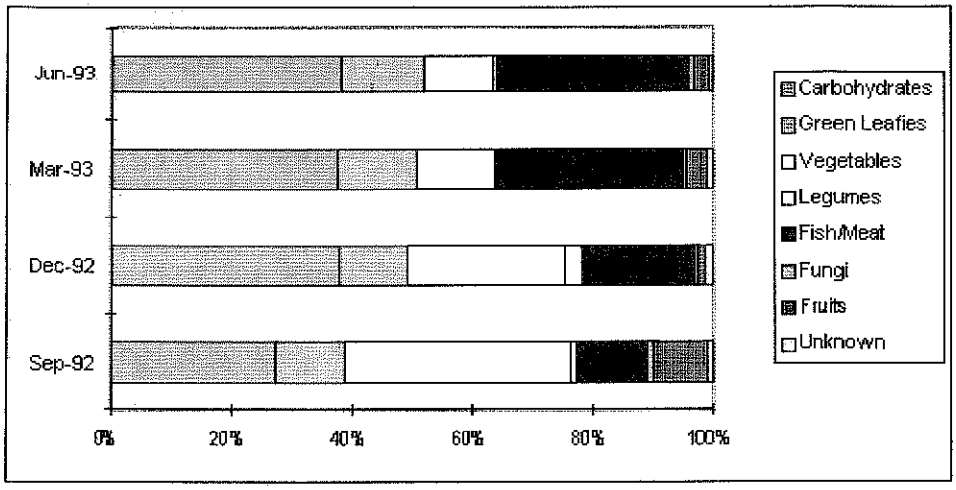

Figure 8. Nutritional Categories of Foods Consumed, Wong Garai, 1992-93.

The primary carbohydrate in both communities is rice—although in Ng. Kedebu' it is virtually all bought, and in Wong Garai it is all home grown. In previous analyses of comparable data from Dayaks, we deleted rice from our graphs and figures, because of its overwhelming dominance in the local diet (e.g., Colfer and Soedjito 1996; Colfer *et al.* 1997a). In this study we retain it, for local comparative purposes.

Sources of Foods

Another important, food-related issue for natural resource management is the source of people's foods. The degree to which people are integrated into a cash economy is important, and the proportion of their food that is bought represent two indicators of this integration (or its lack). The two ethnic groups differ dramatically in the amount of food

that they buy, with the Malay purchasing an average of 59 % of their food, and the Iban purchasing 9 %, during the four months of study periods (Figures 9 and 10).

In both Ng. Kedebu' and Wong Garai aquatic and bought sources of food are significant in their agroforestry systems. The people of Ng. Kedebu' are intimately integrated into a money economy, but at the bottom end of the economic hierarchy. The Iban, on the other hand, do not use their money for subsistence purposes; rather they are more likely to buy consumer goods and pay for their children's education (Wadley 1997a). Both communities' dependence on natural resources is equally clear (primarily rivers and lakes for the Malay; the forest for the Iban).

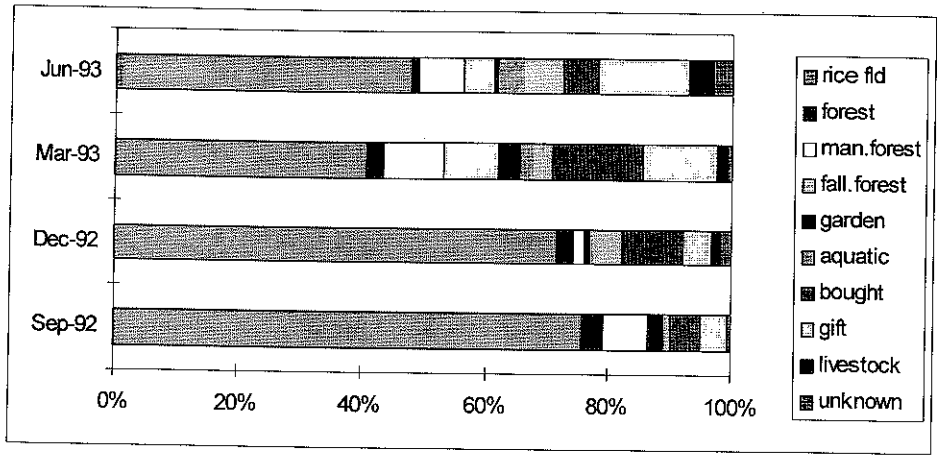

Figure 9. Sources of Food Reported in Ng. Kedebu', 1992-93.

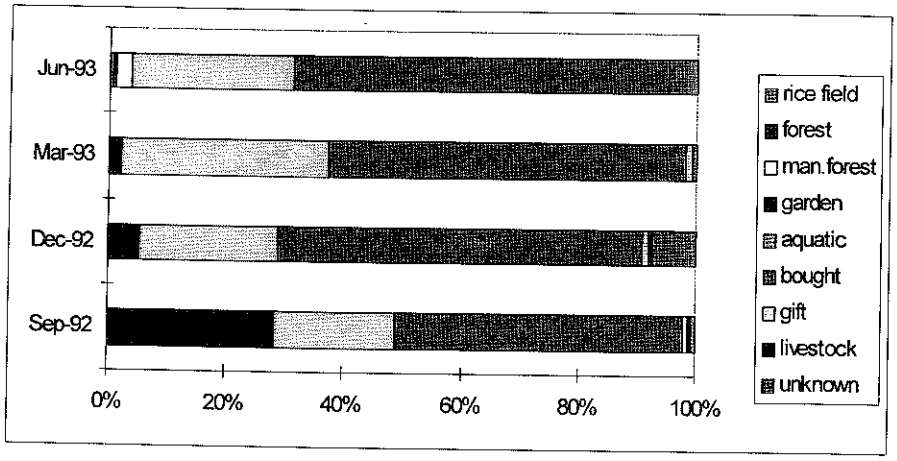

Figure 10. Sources of Food Reported in Wong Garai, 1992-93.

Food and Management Issues
• What foods do people in the main study communities eat? How balanced is their diet, or how balanced could it be, given local resources? How does this vary over the course of a year? • How nutritious is the diet available to local people? • Where are the main sources of food for local people and how do these vary by ethnic group?

Summary and Conclusions

What then is the use of all this information and its gathering process about local people, in the pursuit of better conservation area management?

First, and most simply, in the process of supervising data collection, a manager meets with the local people, ensuring continuing data entry and asking questions about records that are unclear. In this way, a holistic understanding of local people's constraints and opportunities critical to good co-management begins to emerge. The rapport building process, necessary in co-management, progresses.

Second, the specific results help the manager in the creative process of developing management strategies, where a variety of goals, assumptions, and practices by different stakeholders need to come together into an integrated and complementary whole.

Although a manager may quickly recognize that there are two ethnic groups in the area, the extent of their differences in resource use is not immediately obvious to most biophysical scientists whose attention is normally directed elsewhere. This recordkeeping provides the very specific kinds of information that are often needed to make links between, for instance, biodiversity and human use issues. Who uses what, and how much of it?

Knowing how dependent are particular groups on particular resources can help managers to accept or reject various management ideas they may have. A manager who knows how dependent local people are on a specific endangered species will have a much clearer idea of how much effort may be required to protect it. The level of integration into a monetary economy also may influence managers' decisions about various potential strategies (e.g., to develop income generating activities or not; to propose management actions that require monetary expenditures or financial sacrifice on the part of local people or not).

The recordkeeping also provides information on the division of labor within households and communities. This kind of information is crucial for a manager in trying to tap into and enhance local management practices. DSNP managers who may want to reduce agricultural activity within the Reserve, for example, need to know that women are the farmers there; managers need to address their efforts to them, whether the technique is encouraging floating gardens, income generation activities, or awareness campaigns.

Conversely, if DSNP management wants to focus on a particular habitat (like flooded forest or old growth), this kind of data can clarify what is taken from that habitat by whom and in what quantities. Patterns of resource use emerge quite clearly and,

combined with the biophysical knowledge of most managers, can be used to pinpoint problem areas, potential benign marketing strategies, and areas of useful indigenous knowledge and management (potential or extant).

Finally, these data, easily quantifiable, provide convenient material to support management's conclusions about appropriate "next steps" in local management. They can also help to explain problem areas (e.g., trying to protect an endangered otter in a community where fishing is a critical subsistence base). Very pragmatically, these data are useful in demonstrating to funding agencies, evaluators, and central planners, the reasons behind local management decision, in areas where the needs of local people are considered important.

Acknowledgments

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Throughout most of 1992-93, we were working only with local data collectors, Pak Sahar of Ng. Kedebu', Pak Andi Erman of Pulau Duri', and boat driver, Pak Markan of Cincin. All three provided invaluable support and help to this research.

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We would finally like to thank the people of Ng. Kedebu', Wong Garai, and Bemban who must remain nameless, but to whom we owe so much for their kindness, generosity, and patience.

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Appendix A. Fish Reported Captured, Ng. Kedebu', 1992-93.

Malay Name	Probable Latin Name	No. times reported	Percent times reported	Amount reported in Kg	Amount reported in Ekor
Bilis	*Clupeichthys bleekeri*	552	21.2	3251.45	1
Lais	[various kinds]				
• Lais	*Pelteobagrus cf. ornatus*	344	13.2	284.00	18457
• Lais butu	*Ompok hypophthalmus*	79	3.0	23.00	4763
• Lais jungang	*Kryptopterus apogon*	42	1.6	4.00	775
• Lais p	*?*	21	0.8	0	1222
• Lais banga	*Kryptopterus micronema*	19	0.7	7.00	123
• Lais sengro	*?*	1	0.1	0	10
• Lais panak	*?*	3	0.1	0	90
Total Lais [various kinds]		*509*	19.5	318.00	25440
Patik/Baung					
• Patik	*Mystus nemurus*	469	18.0	1680.30	238
• Baung	*Mystus planiceps*	39	1.5	69.70	92
Total Patik/Baung		508	19.5	1750.00	330
Total Recorded as Lais or Patik/ Baung[1]		1029	39.5	2132.00	26658
Umpan	*Puntioplites waandersii*	176	6.8	292.25	424
Kelabau	*Osteochilus melanopleura*	99	3.8	93.40	228
Landin	*Mystus nigriceps*	51	2.0	427.00	79
Jelawat	*Leptobarbus hoevenii*	41	1.6	0	770
Kapas	*Rohteicthys microlepis*	39	1.5	70.00	139
Buin	*Cyclocheilichthys sp.*	38	1.4	56.00	88
Genus *Channa*					
• Toman	*Channa micropeltes*	20	0.7	129.50	16
• Delak	*Channa striata*	16	0.6	78.50	8
• Runtuk	*Channa sp.*	2	0.1	1.00	2
• Piyang	*Channa marulioides*	1	0.1	1.00	0
Total for Genus *Channa*		39	1.5	210.00	
Kelampak	*Parachela oxygastroides*	37	1.4	8.00	452
Tengku-lan	*?*	33	1.3	72.50	36
Nuayang	*Pseudeutropius sp.*	31	1.2	43.80	350
Juara	*Pangasius polyuranodon*	30	1.1	22.50	46
Belantau	*Macrochirichthys macrochirus*	23	0.9	11.00	75
Palau	*Osteochilus kahajanensis*	22	0.8	24.00	24
Emperas	*Cyclocheilichthys apogon*	22	0.8	18.50	100
Patung	*Pristolepis fasciata*	21	0.8	22.50	87
Belida	*Chitala lopis*	20	0.8	64.00	7
Ulang uli	*Botia macrachantus macracanthus*	20	0.8	0	2004
Entukan	*Thynnichthys thynnoides*	19	0.7	75.00	57
Kebali	*Osteochilus schlegelii*	17	0.6	22.50	39
Tebirin	*Belondotichthys dinema*	16	0.6	27.50	38

Senara	*Paradoxcodacna piratica*	15	0.6	1.00	96
Butug	?	14	0.5	0	658
Bauk	[various kinds]				
• Bauk	?	7	0.3	60.00	0
• Bauk ketup	*Thynnichthys polylepis*	3	0.1	32.00	0
• Bauk tuduy	?	1	0.1	4.00	0
Total Bauk		11	0.4	96.00	0
Tilan	*Macrognathus maculatus*	11	0.4	15.50	6
Kenyuar	*Luciosoma trinema*	10	0.4	7.50	37
Bundong	?	10	0.4	0	330
Tapah	*Wallago leeri*	8	0.3	10.50	5
Biawan	*Helostoma temminckii*	8	0.3	18.50	0
Tengalan	*Puntioplites bulu*	8	0.3	11.00	17
Siluari	*Lycothrissa crocodilus*	7	0.3	0	27
Kelik	*Clarias sp.*	6	0.2	0	29
Lipi	*Parachela spp.*	6	0.2	0.13	17
Other fishes*	[various kinds, reported less than 5 times]	32	1.8	45.50	1247
Undifferentiated Species					
• BK	[large fish]	25	1.0	134.00	4
• BT	[medium size]	17	0.6	72.00	127
• BTK	[med. Large]	5	0.2	16.00	0
• Ikan barang	[junk fish]	28	1.1	74.30	441
• Ikan campur	[mixed fish]	3	0.1	9.00	0
Total Undifferentiated species		78	3.0	305.3	572
Total		**2599**	**100.0**	**7462.33**	**34759**

These are trips where *lais* or *patik/baung*, or both *lais* and *patik/baung* together were caught.

*Names of fish which were reported less than 5 times, in Ng. Kedebu', 1992-93: Seluang (*Rasbora sp.)*, Temunit (*Labeo chrysophekadion)*, Ketutuk *(Oxyeleotris marmorata)*, Tamban (?), Tengadak (*Barbodes schwanenfeldii*), Keroyak (?), Langkung (*Hampala macrolepitoda*), Kujam (*Labiobarbus spp.*), Buntal (*Tetraodon spp.*), Kedukul (*Amblyrhynchthys truncatus*), Kelukoi, Ringau (*Datnoides microlepis*), Tawang (?), Piyam (*Leptobarbus melanopterus*).

Appendix B. Fish Reported Captured, Wong Garai, 1992-93.

Iban Name	Probable Latin Name	No. times reported	Percent times reported	Amount in Kg	Amount in "Iko"
Lais [various kinds]					
• Lais	*Pelteobagrus cf. Ornatus*	1	0.2	0	0
• Lais banga	*Kryptopterus micronema*	24	4.2	4.00	41
• Lelipai	*Silurichthys spp.*	13	2.2	3.00	20
Total Lais [various kind]		38	6.6	7.00	61
Patik/ Baung					
• Baung	*Mystus planiceps*	68	11.7	12.00	134
Total Patik/Baung		68	11.7	12.00	134
Total Recorded as Lais or Patik/ Baung[1]		106	18.3	19.00	195
Banta'	*Osteochilus microcephalus*	74	12.8	21.00	100
Undai	[shrimp]	59	10.2	11.55	63
Enseluai	*Rasbora sp.*	53	9.3	8.00	135
Keli'	*Clarias sp.*	43	7.4	7.00	110
Geregit	*Leiocassis cf. Stenomus*	29	5.0	6.50	85
Pansik	*Botia hymenophysa*	25	4.3	1.50	39
Palau	*Osteochilus kahajanensis*	20	3.5	4.50	16
Kujam	*Labiobarbus spp.*	16	2.8	3.50	14
Kemujuk	*?*	14	2.4	0.50	14
Gerama'	*Gecarcinus spp.*	13	2.2	0	42
Tekuyong	[snails]	12	2.1	4.00	0
Genus *Channa*					
• Toman	*Channa micropeltes*	1	0.2	0	0
• Delak	*Channa striata*	10	1.8	11.00	10
Total for Genus *Channa*		11	2.0	11.00	10
Buing	*Cyclocheilichthys sp.*	11	1.9	0	115
?	*Macrognathus maculatus*	8	1.4	1.00	4
Gerang	*?*	8	1.4	0	17
Adong	*Hampala macrolepitoda*	7	1.2	0.50	3
Buntal	*Tetraodon sp.*	6	1.0	5.00	28
Unknown		6	1.0	0	8
Other Fishes*	[various kinds, reported less than 5 times]	56	4.9	15.00	205
Total		**577**	**100.0**	**121.05**	**1247**

[1] These are trips where *lais* or *patik/baung*, or both *lais* and *patik/baung* together were caught.

*Names of fish which were reported less than 5 times, in Wong Garai, 1992-93: Nyenyuar (*Luciosoma trinema*), Lelabi [soft-shelled turtles], Kerimpok (?), Patong (*Pristolepis fasciata*), Engkarit (*Puntius eugrammus*), Lelekat (?), Bauk (?), Pama [frogs], Ngewai (?), Runto' (*Ophiocephalus sp.*), Keyulong (*Xenentodon canciloides*), Memuri' [tadpoles], Riu' (*Pangasius macronema*), Leladin (*Mystus nigriceps*), Rusit (?), Anak beluh (?), Bah (?), Belau (*Ophiocephalus sp.*), Buntat (?), Empelasi' (*Betta spp.*), Entebali (?), Gerau (?), Keripalu (?), Memayut (?), Empelung (?), Peranak (?), Petok (?), Surik (?).

Appendix C. Fish Reported Captured, Bemban, 1992.

Iban Name	Probable Latin Name	No. times reported	Percent times reported	Amount in Kg	Amount in "Iko"
Baung	*Mystus planiceps*	14	25.5	13.50	157
Leladin	*Mystus nigriceps*	13	23.6	7.00	81
Runto'	*Ophiocephalus sp.*	7	12.7	0.10	5
Bawan	*Helostoma temminckii*	6	10.9	1.00	95
Lais	*Pelteobagrus cf. Ornatus*	4	7.3	0	0
Patong	*Pristolepis fasciata*	2	3.6	0	0
Kerimang	*?*	2	3.6	1.00	15
Ni'	*?*	2	3.6	3.00	40
Delak	*Channa striata*	1	1.8	0	0
Lelabi	[Soft-shelled turtles]	1	1.8	49.00	4
Gerinung	*?*	1	1.8	0	0
Kerandung	*Ophiocephalus pleurothakmus*	1	1.8	0	0
Padi	*?*	1	1.8	0	0
Total		**55**	**100.0**	**74.60**	**397**

Appendix D: Crops Harvested in Ng. Kedebu', 1992-93.

Local Names	Probable Latin Names	Frequency	Percentage
Retak	[Green beans]	52	22.3
Buah perenggi	[Squash]	46	19.7
Daun ubi	*Manihot esculenta* [cassava leaves]	31	13.3
Retak panjang	*Vigna sinensis* [longbeans]	31	13.3
Jagung	*Zea mays* [corn]	23	9.9
Daun retak panjang	*Vigna sinensis* [longbean leaves]	8	3.4
Daun retak	[Green beans leaves]	7	3.0
Ubi	*Manihot esculenta*[cassava]	6	2.6
Entimun	*Cucumis sativus* [cucumber]	6	2.6
Daun perenggi	[Squash leaves]	5	2.1
Kacang duduk	[peanuts]	4	1.7
Buah kusut (Gambas)	*?*	4	1.7
Daun cangkok	*Sauropus spp.*	4	1.7
Terong cina	[Chinese eggplant]	2	0.9
Daun timun	*Cucumis sativus* [cucumber leaves]	2	0.9
Daun kangkung	*Ipomoea aquatica* [swamp cabbage]	1	0.4
Paku' manis	[fern]	1	0.4

Appendix E: Agricultural/Agroforest Products in Wong Garai, 1992-93.

• Field and Garden Products

Local Names	Probable Latin Names	Frequency	Percentage
Cangkok	*Sauropus spp.*	36	8.5
Daun empasa'	*Manihot esculenta* [cassava leaves]	27	6.4
Daun ensabi	*Allantospermum borneensis*	21	5.0
Kebari'	Bittermelon?	20	4.7
Tebu	*Saccharum officinarum* [sugarcane]	16	3.8
Retak	[Green beans]	16	3.8
Empusut	*Luffa aegyptica*	11	2.6
Terong	*Solanum spp.* [eggplant]	10	2.4
Daun subung	[*Xanthosoma mafaffa* leaves]	4	0.9
Terong pipit	*Solanum torvum*	4	1.0
Lia'	*Zingiber spp.* [ginger]	3	0.7
Kacang (Cabe)	*Capsicum frutescens* [chillie]	3	0.7
Terong cina	Chinese eggplant	1	0.2
Buah rampo'	*Cucumis sativus* [cucumber]	1	0.2
Buah empasa'	*Manihot esculenta*[cassava]	1	0.2
Pisang	*Musa spp.* [banana]	1	0.2
Daun entaban	*Poikilospernum spp.*	1	0.2
Daun jebuk	*Celosia argentea*	1	0.2
Pako' & Cangkok		1	0.2

• Agroforests Products

Local Names	Probable Latin Names	Frequency	Percentage
Ai' ijuk	[Wine of] *Arenga pinnata*	48	11.4
Buah rian	*Durio zibethinus* [durian]	32	7.6
Buah sibau	*Nephelium reticulatum*	17	4.0
Buah pedalai	*Artocarpus sericicarpus*	15	3.6
Dedabai	*Canarium odontophyllum*	13	3.1
Kayo' api	[Firewood, various kinds]	13	3.0
Bukoh	*Artocarpus integer*	13	3.0
Engkabang	*Shorea macrophylla*	9	2.1
Ketuntum		8	1.8
Kulat	[mushroom]	6	1.4
*Kemiding	*Stenochlaena spp.*	6	1.4
Upa' panto'	*Eugeissonia utilis*	6	1.4
Engkala	*Litsea garciae*	5	1.2
Buah asam	*Mangifera decandra*	5	1.2
Rembai	*Baccaurea motleyana*	4	0.9
Tubo'	[Bamboo shoots]	4	0.9
Karet/getah	*Harvea braziliensis*	3	0.7
*Kayo' engkelong	*Shorea quadrinervis*	3	0.7
Daun koko	*Theobroma cacao*	3	0.7
Asam pauh	*Mangifera petandra*	2	0.5
Nangka	*Artocarpus heterophyllus*	2	0.5
Buah rungan	*Carica papaya*	2	0.5
*Tucung kecala'	*Etlingera elatior*	2	0.5
*Daun sabong	*Gnetum gnemon*	2	0.5

Petai	*Parkia speciosa*	2	0.5
*Wi	[various species of rattan].	2	0.5
*Kulat mata jane'	*Calostoma spp.*	1	0.2
Inyak	*Cocos nucifera*	1	0.2
Belimbing	*Averrhoa bilimbing* [starfruit]	1	0.2
**Kijang	*Muntiacus spp.*	1	0.2
**Pelandok	*Tragulus spp.*	1	0.2
**Jane'	*Sus barbatus* [wild pig]	1	0.2
*Upa' encala		1	0.2
Mawang	*Mangifera pajang*	1	0.2
Engkeranje'	*Dialium indum*	1	0.2
Purur	*Artocarpus communis*	1	0.2
Ruas	[Lengths of Bamboo]	1	0.2
Upa' payau		1	0.2

*Uncultivated plants

**Game animal

Appendix F. Forest Products with Number of Collecting Trips Recorded in Ng. Kedebu' (1992-93).

Species (Local Name)	Latin/English Name	Number of Trips	Yearly estimate*
Kayu api/bakar	[various kinds, firewood]	62	248
Rotan antu	*Calamus sp* [Rattan]	61	244
Kayu Ntangis	*Randia sp*	28	112
Kayu kelansau	*Dryobalanops abnormis*	11	44
Kayu mengkupas	*wood?*	9	36
Kayu limut	*Casaeria sp. nov.*	6	24
Kayu putat	*Barringtonia acutangula*	6	24
Kayu tahun	*Garcinia sp*	5	20
Kayu jijap	*Eugenia sp*	4	16
Kayu ngkurung	*Grewia spp*	2	8
Atap emang	*Hopea griffithii*	2	8
Atap sirap	[various kinds, shingles]	2	8
Kayu sikop	*Garcinia celebica*	1	4
Kayu kebesi	*Memecylon edule*	1	4
Kayu ngkunik	*Antidesma stipulare*	1	4
Kayu merandap	*wood*	1	4
Kayu tembesuk	*Fragraea fragrans*	1	4
Kayu kemarauan	*Shorea platycarpa*	1	4
Kayu ngkelopak	*wood*	1	4
Papan pukul	*Shorea virescens*	1	4
Kayu belanti	*Baccaurea bracteata*	1	4
Unknown		1	4

*The results from the four months of recordkeeping (number of trips) were multiplied by 3 to estimate the yearly number of trips.
This estimate must be taken with a grain of salt, since there are a number of species marked by real seasonality (i.e., likely to occur only once a year).

Appendix G. Forest Products with Number of Collecting Trips Recorded in Wong Garai (1992-93)

Species (Local Name)	Latin / English Names	Number of Trips	Yearly Estimate~
*Daun empasa'	Cassava leaves	101	404
Kayo' api	Firewood [various kind]	64	256
Tubo'	Bamboo shoots	46	184
*Buah empasa'	Cassava roots	39	156
Pako'	*Fern*	31	124
Kemiding	*Stenochlaena spp.*	28	112
*Daun subong	*Xanthosoma mafaffa* leaves	25	100
Terong	*Solanum spp.*	25	100
Kulat	Mushroom [general]	22	88
Upa' panto'	*Eugeissonia utilis*	20	80
*Tebu	*Saccharum officinarum*	16	64
Pako' ikan	*Diplazium esculentum*	11	44
Entaban	*Poikilospernum spp.*	11	44
*Empusut	*Luffa aegyptica*	11	44
Daun rebung	*Callaria spp.?*	9	36
Ai' ijuk	*Arenga pinnata*	8	32
Buah pedalai	*Artocarpus sericicarpus*	8	32
Pako' kero'	*Nephrolepis bisserata*	7	28
Dedabai	*Canarium odontophyllum*	7	28
*Kacang (cabe)	*Capsisum frutescens*	7	28
**Munsang	Various species of civet	6	24
Upa' entibap	*Arenga saccharifera*	6	24
Buah rian	*Durio zibethinus*	6	24
Buloh	*Bambusa vulgaris*	6	24
Tubo' betong	*Gigantochloa latifolia*	5	20
Buah bukoh	*Artocarpus integer*	5	20
Kulat mata jane'	*Calostoma spp.*	5	20
Daun daup	*Bauhinia spp.*	5	20
**Jane'	*Sus barbatus*	5	20
Kulat buah	*Hygrocybe sp.*	4	16
Kulat bulu	*Panus rudia*	4	16
Kulat ikan	*Pleurotus sp.*	4	16
Daun gelabak	*Pseuderanthenum borneense*	4	16
**Kijang	*Muntiacus spp.*	4	16
Daun	Various kind of leaves	4	16
Buah asam kecala	*Etlingera elatior*	4	16
Ramo'/papan	Lumber [various kind]	4	16
Upa' encala	?	3	12
Kulat kerop	[mushroom]	3	12
Kulat lepit	*Auricularia auricula-judae*	3	12
Buah asam	*Mangifera decandra*	3	12
Kulat dilah kepayang	*Pleurotus sp.*	3	12
Asam pauh	*Mangifera petandra*	3	12
Kulat jalong	*Cookeina sulcipes*	2	8

Kulat gelos	*Lentinus sp*	2	8
**Nyumboh	*Macaca nemestrina*	2	8
*Cangkok	*Sauropus spp.*	2	8
Kayo' jijap	*Eugenia sp*	2	8
Kayo' engkelong	*Shorea quadrinervis*	1	4
**Empeliau	*Hylobates muelleri*	1	4
Daun arak	*Ficus oleaefolia?*	1	4
Inyak	*Cocos nucifera*	1	4
*Kebari'	bittermelon?	1	4
Buah sibau	*Nephelium reticulatum*	1	4
Kulat burak	Gerronema and other	1	4
Kulit pukul	Tree bark for house siding	1	4
Kulan	*Pandanus spp.*	1	4
Kayo' limut	*Casaeria sp. nov.*	1	4
Kayo' belanti	*Baccaurea bracteata*	1	4
Unknown	?	33	

~The results from the four months of recordkeeping (number of trips) were multiplied by 3 to estimate the yearly number of trips.

*Cultivated plants

**Game animal

Appendix H. Forest Products with Number of Collecting Trips, Bemban (December 1992).

Local Names	Latin /English Names	Number of Trips
Empukung	Termite nest	14
Senggang	*Hornstedtia scyphifera*	5
Tubo'	Bamboo shoots	4
Kulan	*Pandanus spp.*	4
Papan	Board [various kinds]	3
Kulit pukul	Tree bark for siding of houses	2
Buloh	*Bambusa vulgaris*	2
Kayu api	Firewood [various kinds]	2
Daun daup	*Bauhinia spp.*	1
*Babi	*Sus barbatus*	1
Kayu ntangis	*Randia sp.*	1

*Game animal

Appendix I. Quantities of Forest Products Gathered in Ng. Kedebu' (1992-93).

Species (Local Name)	Latin Names	Measures		
		Stick	Canoeful	Sheet
Kayu ntangis	*Randia sp*	178	16	0
Rotan antu'*	*Calamus sp*	0	0	8429
Kayu bakar	[various kind]	500	43	0
Kayu belanti	*Baccaurea bracteata*	2	0	0
Papan pukul	*Shorea virescens*	0	0	10
Atap sirap	[various kind]	0	0	600
Atap emang	*Hopea griffithii*	0	0	750
Kayu ngkelopak	*wood?*	0	0	15
Kayu kemarauan	*Shorea platycarpa*	15	0	0
Kayu tembesuk	*Fragraea fragrans*	7	0	0
Kayu mengkupas	*wood?*	2	0	0
Kayu merandap	*wood?*	10	0	0
Kayu kelansau	*Dryobalanops abnormis*	416	0	496
Kayu ngkunik	*Antidesma stipulare*	100	0	0
Kayu jijap	*Eugenia sp*	0	4	0
Kayu tahun	*Garcinia sp*	0	4	0
Kayu putat	*Barringtonia acutangula*	0	3	0
Kayu limut	*Casaeria sp. nov.*	0	5	0
Kayu ngkurung	*Grewia spp*	0	2	0
Kayu kebesi	*Memecylon edule*	0	2	0
Kayu sikop	*Garcinia celebica*	0	1	0

*We find it rather odd that the people measure rattan in "sheets," but that is how they recorded it.

Appendix J. Quantities of Forest Products Gathered in Wong Garai (1992-93).

Species (Local Name)	Latin Names	Measures							
		Stick	Seed	Bundle	Tails	Back-pack	Sheet	Basket	Stem
Kayo' belanti	*Baccaurea bracteata*				6				
Kayo' jijap	*Eugenia sp*				2				
Kayo' limut	*Casaeria sp. nov.*							1	
Kayo' api	*firewood* [various kinds]			4		61		2	
Kulan	*Pandanus sp*			2					
Ramo'/ papan	*Beam* [various kinds]			2		1		3	
Buloh	*Bambusa vulgaris*					6		1	
Tubo'	Bamboo shoots		22	8	24	5		28.10	
Kulit pukul	Tree bark for siding of houses							1	
Jane'	*Sus barbatus*				3	2			
Daun	[various kinds]					3		2	
Daun Daup	*Bauhinia sp*							5	
Kemiding	*Stenoch-laena spp.*				4			20.63	
Kacang (cabe)	*Capsicum frutescens*			5	1	2		3	
Terong	*Solanum spp.*		6	13	10	5		11.20	
Asam pauh	*Mangifera petandra*			2		1		1	
Daun empasa'	*cassava leaves*	5		6	30	26	2	57.95	
Buah empasa'	*cassava roots*		18	4	11	21		16	
Buah rian	*Durio zibethinus*					6			
Kulat mata jane'	*Calostoma spp.*							3.50	
Kulat burak	*Gerronema and other*							0.25	
Kulat	*Pleurotus*			2		1		0.50	

dilah kepayang	*sp.*							
Kulat	Mushroom [general]				3	6	9.20	
Buah sibau	*Nephelium sp*		1					
Dedabai	*Canarium odonto-phyllum*				13			
Kebari'	*Bittermelon ?*					2		
Daun subong	*Xantho-soma mafaffa* leaves			2	1	8	13.85	
Empusut	*Luffa aegyptica*						11	
Buah bukoh	*Artocarpus integer*		4			3	1	
Buah pedalai	*Artocarpus serici-carpus*		20	5	6	1		
Pako'	*fern* [general]				3	7	22.26	
Cangkok	*Sauropus spp.*						2	
Upa' entibap	*Arenga sacchari-fera*	11	2	2		1	1	
Upa' panto'	*Eugeis-sonia utilis*	3		6	19	6		
Buah asam	*Mangifera sp*				3	5		
Nyur/ inyak	*Cocos nucifera*						1	
Entaban	*?*	1					10.25	
Kayo' api	Firewood [various kinds]			16	2	9	2	
Ai' ijuk	*Arenga pinnata*						13	
Kijang	*Muntiacus spp.*				5			
Daun rebung	*Callaria spp.?*			11	6	1	2.55	
Daun arak	*Ficus oleaefolia*						0.50	
Tucung kecala	*Etlingera elatior*						1.13	2
Nyum-boh	*Macaca nemestrina*				1		1	
Pako' ikan	*Diplazium*				8	2	4	

	esculentum					
Tubo' betung	*Giganto-chloa latifolia*	5			2	1.05
Daun gelabak	*Pseuderan-thenum borneense*		6			3
Kulat ikan	*Pleurotus sp.*			3		0.26
Munsang	Various species of civet			6	1	
Kulat lepit	*Auricularia auricula-judae*					0.31
Kulat bulu	*Panus rudia*		8			2.13
Empe-liau	*Hylobates muelleri*			1		
Kulat gelos	*Lentinus sp*					2.13
Kulat jalong	*Cookeina sulcipes*					1.50
Pako' kero'	*Nephrolepi s biserrata*		1	5		6
Kulat kerop	*a mush-room*			1		2.05
Kulat buah	*Hygrocybe sp.*					4
Upa' encala	*?*				2	1
Kayo' engke-long	*Shorea quadri-nervis*			9		
Tebu	*Saccharum officinarum*	6	15		5	7.05
Unknown	*?*		13	9	10	9.10

Appendix K. Quantities of Forest Products Gathered in Bemban (December 1992).

Spesies (Local Names)	Latin/English Name	Measures					
		Stick	Seed	Canoeful	Bundle	Back-pack	Sheet
Kayu Ntangis	*Randia sp*	0	0	0	0	1	0
Kayu api	Firewood [various kind]	7	0	3	0	0	0
Empukung	Termite nest	0	80	0	0	16	0
Kulan	*Pandanus spp.*	0	0	0	6	0	0
Senggang	*Hornstedtia scyphifera*	0	0	0	8	0	0
Papan	Board [various kind]	49	0	0	0	0	0
Buloh	*Bambusa vulgaris*	4	0	0	0	0	0
Tubo'	Bamboo shoots	5	30	0	0	0	0
Kulit pukul	Tree bark for siding of houses	20	0	0	0	0	0
Babi	*Sus barbatus*	1	0	0	0	0	0
Daun daup	*Bauhinia spp.*	1	0	0	0	0	0

Appendix L. Frequency of forest product collected in Ng. Kedebu', 1992-1993, by location.

Location	Kind of Forest Product																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Bangkal begetah										1											
Batang Pengembung		1	1																		
Belibis Danau		18																			
Dua Menanga	3	9	5																		
Kuran Besar Lebak Resau			1										1								
Lebak T. H.		1	1																		
Lengkong			2																		
Lengkong Pangas		2																			
Lengkung Bt. Tekenang	2		2																		
Lubuk Mensidang											1										
Lungai			1																		
Menyuku'			1																		
Ng. Santik/ Lengkong Santik	3		9								6					1			1		
Ngkuran	8	3	1												2	1	1			1	
Penyelawat			4				2						9								
Pintas Jenat			7													1					
Pintas Senten		2																1			
Pulau Midin															1	1			1		
Seberang Batu Petuleh			2								1										
Seberang kampung		1													1			1			
Sepandan		5	2									1									
Sepandan Kerinan	1		2												1	1					
Sg. Lebak Langkan	9		2																		1
Sg. Nanga		1																3			
Sg. Panjang		7																			
Sg. Pekah		3																			
Sg. Ramut		1						1			1			1							
Sikeng Telak tonggak		1																			
Suak Panjang		3																			
Sumpa'			5																		
Tekenang									1												
Telok Jengger (Selimbau)	1																				
Tepi Tawang	1	1	2		1	2							1								
Tong			4																		
Tong Besar/Pulaunya		2	7	1																	

1 = Kayu ntangis (wood)
2 = Rotan antu' (rattan)
3 = Kayu bakar (firewood)
4 = Kayu belanti (wood)
5 = Papan pukul (wood)
6 = Atap sirap (shingles)
7 = Atap emang
8 = Kayu ngkelopak (wood)
9 = Kayu kemarauan (wood)
10 = Kayu tembesuk (wood)
11 = Kayu mengkupas (wood)
12 = Kayu merandap (wood)
13 = Kayu kelansau (wood)
14 = Kayu ngkunik (wood)
15 = Kayu jijap (wood)
16 = Kayu tahun (wood)
17 = Kayu putat (wood)
18 = Kayu limut (wood)
19 = Kayu ngkurung (wood)
20 = Kayu kebesi (wood)
21 = kayu sikop (wood)

Appendix M. Frequency of forest product collected in Bemban, December 1992 , by location.

Location	Forest Product										
	kayu api	*em-pu-kung*	*kula-an*	*seng-gang*	*papan*	*buluh*	*tubu*	*kulit pukul*	*babi*	*daun*	*daun dacip*
Babas (forest)	1	13	4	5				1		1	1
Bangkal begetah	1										
Danau										1	
Danau Pegah (lake)									1		
Emperan (floodplain)					2		1	6			
Lubuk Mensidang	1										
Ng. Santik/ Lengkong Santik Ngkuran	6										
Penyelawat	4										
Pintas Jenat	3										
Seberang kampung	4			1					4	1	
Sepandan Kerinan					1						
Sg. Empaik	1	1			1			2			
Sg. Lebak Langkan											
Tembawai (ex-housesite)							1	4			

Appendix N. Frequency of forest product collected in Wong Garai, 1992-1993, by location

Forest Product	Location										
	1	2	3	4	5	6	7	8	9	10	11
Kayu belanti											
Kayu jijap									1		
Kayu limut									1		
Kayu api	1	2	4		1	1		43	6		
Kulaan											
Papan			1					1			
Buluh			2					1	3		
Tubu (Rebung)		2	42					1			
Kulit pukul			1								
Babi/Jane'	1									1	
Daun			1						1		
Daun daup									5		
Kemiding	2	13	2		1				10		
Kacang (Cabe)	3		2			1			1		
Terong	19							1	5		
Asam pauh								2			
Daun empasak	37		27			1		20	13		
Buah empasak	22		7					2	7		
Buah rian			1			1		1	2		
Kulat mata jane		2	2								
Kulat burak		1									
Kulat dilah kepayang	1	1			1						
Kulat	3	5	6					3	3		
Buah sibau	1										
Dedabai	1		5								
Kebari'									1		
Daun subung	13	2	4		1			1	1		
Empusut	1							10			
Buah bukoh	1	1	1				1				
Buah pedalai			7								
Pako'	1	6	17		2				5		
Cangkok			2								
Upa' entibab			3					1	2		
Upa' panto'	2		1					1	6		
Buah asam									2		
Buah asam kecala		1							1		
Nyur/inyak			1								
Enteban		1	1					6	3		
Ai' ijok	1		5						2		
Kijang	2		1								
Daun rebung			4	1		1			1		
Daun arak		1									
Tucung kecala			2								
Nyumboh		1						1			
Pako' ikan	2		7		1				1		
Tubo betung			4								
Daun gelabak			4								
Kulat ikan			4								
Munsang		1	1						1		
Kulat lepit		1	2								
Kulat bulu		1	1					1	1		
Empeliau		1									
Kulat gelos		1	1								

Kulat jalong			2			
Pako kero		3	3			
Kulat kerop			3			
Kulat buah			2	1	1	
Upa' encala					2	
Kayo engkelong	1					
Tebu	7		4	1	4	
Unknown	11		12	1	3	3

1 = Lake (Danau)
2 = Forest (Babas)
3 = Floodplain (Emperan)
4 = Housegarden (Redas/Kebun)
5 = Tree reserve (Pulau)
6 = Rubber grove (Kebun)
7 = Old longhouse site (Tembawai)
8 = Hill field (Umai bukit)
9 = Fallowed forest (Damun)
10 = Swamp (Paya')
11 = Unknown

Appendix O Frequencies of foods consumed by month, Ng. Kedebu' (1992-93)

Food Category/ Local Names	Latin/ English Names	Sept. 92 Freq/%		Dec. 92 Freq/%		Mar. 93 Freq/%		June 93 Freq/%	
Carbohydrates		**441**	**38.5**	**326**	**37.0**	**334**	**41.3**	**638**	**44.2**
Nasi	*Oryza sativa*	414	36.2	295	33.5	296	36.6	577	40.0
Ubi	*Manihot esculenta*	10	0.9	21	2.4	6	0.7	38	2.6
Mie	Noodles	7	0.6	4	0.5	13	1.6	16	1.1
Kerupuk ikan	Belida chips	5	0.4	2	0.2	15	1.9	4	0.3
Kentang	*Solanum spp.*	3	0.3	1	0.1	3	0.4	3	0.2
Keladi	Taro	1	0.1	3	0.3	1	0.1		
Green Leaves		**111**	**9.7**	**14**	**1.6**	**28**	**3.5**	**48**	**3.3**
Daun ubi	Cassava leaves	73	6.4	9	1.0	16	2.0	29	2.0
Daun perenggi Perenggi	Squash leaves	15	1.3					1	0.1
Daun retak panjang Panjang	Long-bean leaves	13	1.1						
Daun entimun	*Cucumis sativus* leaves	4	0.3			48	5.9		
Sawi	?	4	0.3			2	0.2		
Kangkung	*Ipomoea aquatica*	3	0.3	1	0.1	1	0.1	2	0.1
Daun Cangkok	*Sauropus spp.*			2	0.2			1	0.1
Paku' kemiding	fern [general]			2	0.2 .2	2	0.2	3	0.2
Paku' kubuk	?							8	0.6
Paku' keruk	*Nephro-lepis biserrata*							2	0.1
Paku' ikan	*Dipla-zium esculen-tum*							1	0.1
Bayam	*Amaran-thus spp.*					2	0.2	1	0.1
Kucai	*Allium tubero-sum*					3	0.4		
Kantu rungan	Papaya leaves					1	0.1		

Vegetables		**134**	**11.7**	**190**	**21.6**	**89**	**11.0**	**1,206**	**8.3**
Entimun	*Cucumis sativus*	42	3.7	66	7.5	48	5.9	8	0.6
Kacang/cabe	*Capsicum frutescens*	23	2.0	40	4.6	21	2.6	32	2.2
Lungkang jeli'	Baby corn	18	1.6					1	0.1
Buah perenggi perenggi	Squash	9	0.8	65	7.4	10	1.2	1	0.1
Terong	*Solanum spp.*	8	0.7			3	0.4	45	3.1
Jagung	*Zea mays*	7	0.6						
Nangka	*Artocarpus integer*	6	0.5	7	0.8	2	0.2	10	0.7
Kol	Cabbage	4	0.3	1	0.1				
Terong Cina	Chinese Eggplant	4	0.3					3	0.2
Empusut	*Luffa aegyptica*	2	0.1						
Kepare	Bitter-melon	2	0.2	1	0.1				
Labu	Gourd	1	0.1			4	0.5	1	0.1
Rebung	Bamboo shoots	1	0.1	7	0.8			15	1.0
Tomat	Tomato	1	0.1						
	Chinese Cucumber							1	0.1
Cangkok	*Sauropus spp.*			3	0.3				
Jantung pisang	banana flower							1	0.1
Lia'	*Zingiber sp*					1	0.1		
Legumes		**166**	**14.5**	**8**	**0.9**	**18**	**2.2**	**1**	**0.1**
Retak panjang	Green beans	163	14.2						
Jengkol	*Pithecellobium jiringa*	2	0.2	7	0.8	18	2.2		
Kacang duduk	?	1	0.1	1	0.1			1	0.1
Fish/Meat		**263**	**23.0**	**301**	**34.2**	**264**	**32.7**	**603**	**41.8**
Patik/Baung	*Mystus spp.*	67	5.9	33	3.8	84	10.4	98	6.8

Lais	[various kind]	46	4.0	15	1.7	58	7.2	64	4.4
Ikan asin	Salt-Dried fish	43	3.8	12	1.4	33	4.1	89	6.2
Landin	*Mystus nigriceps*	29	2.5			7	0.9	6	0.4
Belida	*Chitala lopis*	16	1.4	3	0.3	10	1.2	5	0.3
Ringau	*Datnoides microlepis*	10	0.9			3	0.4	6	0.4
Ikan	Fish [general]	8	0.7	15	1.7	6	0.7	125	8.7
Telor ayam	Chicken egg	6	0.5	3	0.3	5	0.6	8	0.6
Bauk	[various kind]	6	0.5	44	5.0	3	0.4	37	2.6
Genus *Channa*		5	0.4	24	2.7	11	1.3	37	2.5
• Toman	*Channa microlpeltes*	4	0.3	23	2.6	11		31	2.1
• Delak	*Channa striata*	1	0.1	1	0.1			6	0.4
Tapah	*Wallago leeri*	4	0.3	1	0.1	1	0.1		
Bawan	*Helostoma temminckii*	4	0.3			2	0.2	5	0.3
Bangah	?	4	0.3	3	0.3	2	0.2	17	1.2
Telor Ikan	Fish egg	4	0.3			1	0.1		
Juara	*Pangasius polyuranodon*	3	0.2	10	1.1	7	0.9	22	1.5
Tengalan	*Puntioplites bulu*	2	0.2	1	0.1			8	0.6
Patung	*Pristolepis fasciata*	2	0.2	1	0.1			2	0.1
Kenyuar	*Luciosoma trinema*	2	0.2					1	0.1
Kelabau	*Osteochilus melanopleura*	2	0.2	2	0.2			1	0.1
Sarden	Sardines	1	0.1	3	0.3	6	0.7	3	0.2
Kaloi	*Osphron*	1	0.1						

	emus goramy								
Bantak	*Osteo-chilus micro-cephalus*	1	0.1						
	Salai fish	1	0.1			3	0.4	49	3.4
Jukut	Fermen-ted fish	1	0.1			1	0.1		
Tebirin	*Belon-dotich-thys dinema*	1	0.1					7	0.5
Bilis	*Clu-peichthys bleekeri*			86	9.8	15	1.9	9	0.6
Keli'	*Clarias sp.*			2	0.2			2	0.1
Ayam	Chicken			5	0.6			1	0.1
Kijang	*Munti-acus sp.*			38	4.3	6	0.7		
Bayak	?							1	0.1
Fungi								**5**	**0.3**
Kulat	Mush-room							5	0.3
Fruits		**19**	**1.7**	**7**	**0.8**	**10**	**1.2**	**17**	**1.2**
Tempoyak	*Durio zibethi-nus*	14	1.2			9	1.1		
Nyur	*Cocos nucifera*	4	0.3			1	0.1		
Asam kandis	?	1	0.1						
Pisang	*Musa spp.*			1	0.1			7	0.5
Nenas	*Ananas comosus*			6	0.7			9	0.6
Rampai								1	0.1
Unknown		**11**	**0.9**	**33**	**3.7**	**65**	**8.0**	**11**	**0.7**
Total Record		**1145**	**100.0**	**879**	**100.0**	**808**	**100.0**	**1434**	**100.0**

Appendix P Frequencies of Foods consumed by month, Wong Garai (1992-93)

Food/ Category/ Local Names	Latin/ English Names	Dec. 92 Freq/%		Mar. 93 Freq/%		June 93 Freq/%		Sep. 93 Freq/%	
Carbo-hydrates		**355**	**27.1**	**511**	**40.6**	**810**	**37.2**	**1412**	**37.8**
Asi'	*Oryza sativa*	350	26.7	434	34.5	770	35.4	1347	36.1
Buah empasa'	*Manihot esculenta*	3	0.2	27	2.1	17	0.7	30	0.8
Mie	Noodles	1	0.1			6	0.3	24	0.6
Kerupuk ikan	Belida chips			1	0.1				
Buah subong	*Colocasia esculenta*	1	0.1	49	3.9	17	0.8	11	0.3
Green Leaves		**150**	**11.4**	**154**	**12.2**	**289**	**13.3**	**511**	**13.7**
Daun empasa'	Cassava leaves	13	1.0	104	8.3	177	8.2	227	6.1
Daun entekai	Squah leaves	2	0.2	3	0.2	3	0.1	129	3.5
Daun rampo'	*Cucumis sativus*	103	7.9	1	0.1				
Ensabi	*Allantospermum spp.*							1	0.03
Daun cangkok	*Sauropus spp.*	4	0.3	3	0.2	21	1.0	32	0.9
Pako' [general]	ferns [general]	4	0.3	8	0.6	8	0.4	21	0.6
Pako' kemiding	*Stenochlaena spp*	8	0.6	4	0.3	19	0.9	35	0.9
Pako' kubuk						3	0.1	1	0.03
Pako' kero'	*Nephlorepis biserrata*			1	0.1				
Pako' ikan	*Diplazium esculentum*			1	0.1	2	0.1		
Bayam	*Amaranthus spp.*	2	0.2					7	0.2
Kucai	*Allium tuberosum*	2	0.2	19	1.5	12	0.6	6	0.2
Kantok rungan	Papaya leaves							12	0.3
Daun entaban	*Poikilospernum*	2	0.2			2	0.1	6	0.2

	spp.								
Daun sabong	*Gnetum gnemon*	7	0.5	2	0.2	32	1.5	6	0.2
Daun subung	*Xanthosoma mafaffa* leaves	2	0.2			4	0.2	15	0.4
Kantok lekan	?	1	0.1	4	0.3	1	0.1	2	0.1
Kantok remat	*Lygodium spp.?*			4	0.3				
Ketuntum	?					5	0.2	10	0.3
Kantok mawan	?							1	0.03
Vegetables		**496**	**37.8**	**358**	**20.5**	**292**	**13.5**	**445**	**12.0**
Buah rampo'	*Cucumis sativus*			99	7.9	2	0.1	8	0.2
Kacang/ cabe	*Capsicum frutescens*			2	0.2	9	0.5	3	0.1
Kelapong	Baby corn	4	0.3						
Lingkau Buah entekai	Squash	96	7.3	86	6.8	2	0.1	83	2.2
Terong	*Solanum spp.*	176	13.4			100	4.6	43	1.2
Lingkau	*Zea mays*	85	6.5	23	1.8	1	0.1	1	0.03
Upa'	Palm cabbages							5	0.1
Terong Cina	Chinese eggplant					1	0.1	1	0.03
Empusut	*Luffa aegyptica*	4	0.3					1	0.03
Kebari'	Bittermelon	6	0.5			1	0.1	176	4.7
Genok	Gourd	72	5.5	5	0.4			2	0.1
Tubo'	Bamboo shoots	20	1.5	18	1.4	86	4.1	58	1.6
Tomat	Tomato	7	0.5						
Tungkul pisang pisang	Banana flower			1	0.1				
Lia'	*Zingiber sp*			10	0.8	2	0.1	2	0.1
Bungai entekai	Squash flower	19	1.4						

Daun arak	*Ficus oleae-folia*	4	0.3						
Tucung kecala'	*Etlingera elatior*	2	0.2	2	0.2	6	0.3	5	0.1
Upa' entibap	*Arenga sacchari-fera*	1	0.1	3	0.2	7	0.3	8	0.2
Terong pipit	*Solanum torvum*			4	0.3	5	0.2	4	0.1
Upa' panto'	*Eugeis-sonia utilis*			5	0.4	70	3.2	45	1.2
Legumes		**12**	**0.9**	**38**	**3.0**	**3**	**0.1**	**20**	**0.5**
Retak	Long-beans	12	0.9	38	3.0	3	0.1	15	0.4
Petai	*Parkia spp.*							5	0.1
Fish/Meat		**154**	**11.7**	**256**	**20.3**	**672**	**30.9**	**1,184**	**31.8**
Patik/ Baung	*Mystus spp.*			2	0.2	14	0.6	1	0.03
Ikan Baror	Salt-Dried fish	60	4.6	79	6.3	132	6.0	166	4.5
Ikan	Fish [general]	13	1.0	51	4.1	164	7.5	119	3.2
Telo' manok	Chicken egg	14	1.1	13	1.0	48	2.2		
Genus *Channa*	*Channa spp.*					11	0.6	12	0.3
• Delak	*Channa striata*					1	0.1	11	0.3
• Toman	*Channa micro-peltes*					10	0.5	1	0.03
Tapah	*Wallago leeri*					2	0.1		
Bangah	?					1	0.1		
Telo' ikan	Fish egg							102	2.7
Tengalan	*Puntio-plites bulu*					1	0.1		
Sarden	Sardines							3	0.1
Kaloi	*Osphro-nemus goramy*								
Bantak	*Osteo-chilus micro-chepalus*							1	0.03
Salai	Smoked	15	1.1	35	2.8	71	3.3	132	3.5

Jukut	fish Pickled	1	0.1	20	1.6	6	0.3	208	5.6
Undai	fish shrimp	6	0.5	18	1.4	47	2.2	11	0.3
Bilis	*Clupeichthys bleekeri*					1	0.1		
Keli'	*Clarias sp.*			14	1.1	1	0.1	5	0.1
Manok	Chicken			1	0.1	34	1.6	53	1.4
Kijang	*Muntiacus spp.*	8	0.6	2	0.2	37	1.7	8	0.2
Buing	*Cyclocheilichthys sp.*							1	0.03
Gerama'	*Gegarcinus spp.*	2	0.2	3	0.2	6	0.3		
Pama'	Frog	1	0.1	2	0.2	12	0.6	2	0.1
Jane'	*Sus barbatus*	29	2.2	14	1.1	36	1.7	312	8.4
Kesa'	Ant nest	1	0.1						
Capi	Cow	4	0.3					1	0.03
Lelabi	Soft-shelled turtle			1	0.1			10	0.3
Empeliau	*Hylobates muelleri*			1	0.1			17	0.5
Rusit	Dried fish					48	2.2	10	0.3
Burong	Birds [general]							7	0.2
Rasong	*Nasalis larvatus*							3	0.1
Fungi		**13**	**1.0**	**9**	**0.7**	**14**	**0.6**	**38**	**1.0**
Kulat	[mushroom]	7	0.5	9	0.7	12	0.6	23	0.6
Kulat burak	*Gerronema* and other	2	0.2			1	0.1	12	0.3
Kulat mata jane'	*Calostoma spp.*	2	0.2					2	0.1
Kulat dilah	*Pleurotus spp.*	1	0.1						
Kepayang Kulat muyong	?	1	0.1					1	0.1
Kulat risik	?					1	0.1		
Fruits		**120**	**9.2**	**17**	**1.3**	**76**	**3.5**	**88**	**2.3**

Empikau/ tempoyak	*Durio zibethinus*	5	0.4					21	0.5
Inyak	*Cocos nucifera*	31	2.4			12	0.6		
Pisang	*Musa sp.*	1	0.1	3	0.2	4	0.2	2	0.1
Buah brunei	*Ananas comosus*			9	0.7	1	0.1		
Buah pedalai	*Artocarpus spp.*	55	4.2			29	1.3		
Buah rembai	*Baccaurea motleyana*					5	0.2		
Buah asam	*Mangifera decandra*	1	0.1			10	0.5	15	0.4
Buah punsut	?	12	0.9			2	0.1	23	0.6
Buah purur	*Artocarpus communis*	3	0.2	1	0.1	3	0.1		
Buah dedabai	*Canarium odontophyllum*	9	0.7			1	0.1		
Buah bukoh	*Artocarpus integer*	3	0.2	4	0.3	7	0.3	24	0.6
Buah senggang	*Hornstedtia scyphifera*					1	0.1		
Buah sibau	*Nephelium reticulatum*					1	0.1		
Limau	*Citrus spp.*							1	0.03
Tebu	*Saccharum officinarum*							2	0.1
Unknown		**12**	**0.9**	**15**	**1.2**	**18**	**0.8**	**29**	**0.8**
Total Record		**1,312**	**100.0**	**1,358**	**100.0**	**2,174**	**100.0**	**3,727**	**100.0**