2. LIVELIHOOD OPTIONS AND FARMING SYSTEMS IN THE FOREST MARGINS OF NUNUKAN, EAST KALIMANTAN

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Introduction

The relationship between peoples' livelihood and their management of natural resources has been the main focus of organizations dealing with conservation and sustainable use of natural resources. Agriculture and forests provide an essential contribution to the resilience of many indigenous resource use systems. Forest products constitute a source of emergency food for people living in the forest margins, while economic valuable forest products provided cash through the sale of their products. In the past, natural resource extraction was aimed only to fulfill peoples' basic needs in subsistence economy, although exchange and market are older than what often presumed (Levang *et al.*, 2005). However, population pressure, process of commercialization (as consequence of economic growth) and political-economic conditions are drivers that have changed the way people managing their natural resource (Bilsborrow and Okoth-Ogendo, 1992).

Levang *et al.* (2005) discussed the importance of forest for the local community, the Punan hunter gatherers, living in East Kalimantan. Using the Punan case as an example, the paper critically questioned the widely accepted belief that forest people depend on forests for their livelihoods and rapid pace of deforestation will lead them to poverty.

Protection of the environment is crucial to deal with global concern such as global warming. At the regional and local level, concern is raised about improving livelihoods of local communities as a result of on-going changes within society at local and global levels. The FORMACS (Forest Resource Management for Carbon Sequestration) Project in Kabupaten Nunukan, East Kalimantan is aimed to bridge both global and local concerns. It focuses on providing the indigenous people with sustainable livelihood options at the same time sustaining the function of forest ecosystems in maintaining the carbon stocks, as one of the way to mitigate global warming problem. Consequently, an understanding of forest land use decisions by the local people is an important part of the project.

This paper described the result of a rapid household socio-economic survey conducted in the forest margin villages of Kabupaten Nunukan. The objective of the survey is to gain information on the socio-economic background of farmers and the systems they managed in their landscape. Combined with secondary data, this study will be able to provide information on:

1. Profile of farmers
2. Farmers activities to sustain their livelihood
3. The land use systems managed by farmers and the products and income derived.

This information will be used to simulate the dynamics of the landscape over time as a result of changes in the way people manage their natural resources, with implications for farmers livelihood in Chapter 5 of this report.

Methods

A rapid socio-economic survey was conducted in the FORMACS study area, Kecamatan Sebuku and Sembakung of Kabupaten Nunukan. The respondents were 51 households from 10 villages within the area: Kalun Sayan, Sekikilan, Sujau and Tau Baru village in Sebuku and Atap, Katul, Lubok Buat, Manuk Bungkul, Tanjung Harapan, and Tujung village in Sembakung. The survey used purposive sampling aimed at obtaining information from farmers that manage the main land use systems existing in the area.

General Condition of Kabupaten Nunukan

Geographic position and area

Kabupaten Nunukan is located in East Kalimantan, strategically positioned as bordering area to Malaysia, in the north to Sabah and in the west to Sarawak (Table 2.1).

When it split from the large Bulungan district, Kabupaten Nunukan was divided into five Kecamatan (District): Kecamatan Krayan, Lumbis, Sembakung, Nunukan dan Sebatik, comprising of 212 villages. In 2003, the Pembeliangan became Kecamatan Sebuku. The total area of Kabupaten Nunukan is around 14243 km^2. The FORMACS study areas of Sebuku and Sembakung districts are 3778 km^{-2} and 2263 km^{-2}, respectively, representing around 42% of the area of Kabupaten Nunukan.

Table 2.1. Geographic position of Kabupaten Nunukan

Geographic Position:		
Latitude	:	3° 30' 00" – 4 °24'55" East
Longitude	:	115° 22' 30" – 118° 44' 54" North
Borders of region:		
- North	:	Sabah, Malaysia
- East	:	Celebes Sea
- South	:	Kabupaten Bulungan and Kabupaten Malinau
- West	:	Sarawak, Malaysia

Source: http://www.nunukankaltim.go.id/

Table 2.2. Area of districs in Kabupaten Nunukan (values in brackets refer to percetage of area)

No.	Districts	Area (ha)	
1.	Nunukan	144 265	(10.1)
2.	Sebatik	24 341	(1.7)
3.	Sebuku	377 774	(26.5)
4.	Sembakung	226 294	(15.9)
5.	Lumbis	291 615	(20.5)
6.	Krayan	360 044	(25.3)
	TOTAL	**1 424 334**	

Source: Hatfindo Prima (2004)

Population dynamics

The population of Kabupaten Nunukan in 2002[1] was 84 786 persons with an annual population growth of 3.24%. Based on these data, the population density of Kabupaten Nunukan is about 6 person km^{-2}. Kecamatan Sebatik and Nunukan are the most populated districts, providing place for 72% of Nunukan population (BPS Kabupaten Nunukan, 2002) with population density of 6.81 and 26.87 person km^{-2}, respectively (Kabupaten Nunukan Dalam Angka, 2001).

A recent survey conducted by CARE International observed that Sebuku district comprise of 21 villages with a total population of 4064 persons in which 54% are male and 46% are female. Sembukung district cover 18 villages with total population of 6010 persons, with similar proportion of male and female as Sebuku.

[1] Result of a socio-economic survey conducted by Regional Planning Agency (BAPPEDA) and Central Statictics Bureau (BPS) Kabupaten Nunukan in August 2002

Climate and topography

Temperature measured in Nunukan (the capital of Kabupaten Nunukan) on average is 27.4^{o}C. The lowest temperature is recorded for June, with average of 23^{o}C and the highest for April and September of 32.2^{o}C.

Average total yearly rainfall is 2326.7 mm year^{-1} and the average total monthly rainfall is 194 mm month^{-1}. The highest monthly rainfall is in May with an average of 367 mm and the lowest monthly rainfall in July with 88 mm. Humidity ranges between 82% to 87%, with average wind velocity at 2.5 m s^{-1}.

The terrain in Kabupaten Nunukan is dominated by a mountain range in the west and lowland peneplain in the east. Steep mountain terrain lies to the north-west, a part of the mountain range, that form the main watershed of the island of Borneo with altitude ranging from 1500 m to 3000 m above sea level. The middle part of Nunukan is hilly with undulating to flat landform towards the east. The hilly area in the south has elevation between 500 - 1500 above sea level. The slopes of mountainous area are around 30%, while in hilly area they range from 8 - 15%.

Soil

Soils in the western part of Nunukan and part of Nunukan and Sebatik islands are red-yellow Pdodzolics with low fertility status and shallow top soil. The peneplain along the river and coast consists of grey sedimentary soil of Gleysols.

The dominant soil structure in Nunukan consists of sub angular block with rigid to very rigid soil consistency and few pores distributed only at top soil. Effective soil depth is from shallow to very shalow with acidity ranging from 3.5 - 4.5. Soil drainage is poor, especially in the peneplain along the river. The soils generally have low suitability for oil palm.

The mountain range area is prone to soil erosion, especially in areas without vegetation. The swamps areas are wet almost throughout the year.

Watersheds

There are two main watersheds in Kabupaten Nunukan: (i) Sebuku watershed which is located in Sebuku district and (ii) Sembakung district which is located in Sembakung and Lumbis districts. Both Sebuku and Sembakung rivers have high debit of water all year through. Rivers located in Kabupaten Nunukan are listed in Table 2.3.

Tabel 2.3. Rivers in Kabupaten Nunukan

No.	River	Length (km)
1	Sembakung	278
2	Sulanan	52
3	Sumalungun	42
4	Sepadaan	32
5	Itay	146
6	Sebuku	115
7	Agisan	62
8	Tikung	50
9	Tabut	30
10	Simenggaris	36

Source: BAPPEDA Propinsi Kalimantan Timur

Land use

Land use in Nunukan can be classified into four main types:

1. Settlement area

Most people live in the peneplain area, 2 - 10 m above sea level, and only a few live in upland/highland area. Most settlements are along the coast, rivers or existing roads.

2. Paddy rice area

Paddy rice area mostly located behind the settlement, in a zone about 100 - 500 m wide in the mainland area or 50 - 150 m from the river or coastline. Nunukan still has vast area that has potential for rice fields.

3. Upland/dryland agriculture systems (Ladang)

Upland rice and other food crops are more inland in the upper part of paddy field area.

4. Plantation (cash crop) area

The main cash crop area is located in Sungai Pancang, around Kecamatan Sebatik. Cacao, coffee, clove, coconut and banana can grow well in this area. Another potential area for coffe and clove is around the Sebuku river.

Household Survey Results

Demographic patterns

The household respondents were mostly head of the family (father/husband), except for two households in Sembakung that were represented by a member of the family (mother/wife). Table 2.4 and 2.5 describes the demographic profile of respondents and the ethnical background. The total number of persons surveyed (respondents and their extended family) in both villages are 275 persons, all under 64 years old with ratio of male to female respondent is around 1:1. From 51 households surveyed, 42 are nuclei[2] families and the rest include extended family. The average family size is 5 person per family. Fifity-six percent of the people surveyed are in their productive age (15 - 64 years old). The dependency ratio[3] in Sebuku is 0.63, slightly lower than 0.87 of Sembakung.

The distribution of ethnical group in Sebuku and Sembakung hardly differs. The main ethnics group are Dayak Agabag and Tidung, respectively composing 85% and 10% of total persons surveyed. The rest are from ethnics group of Flores, Bugis, Timorese, Javanese and Chinese (Table 2.5). Around 50% of the family-heads have stayed in the area longer than 20 years and only 10% have stayed less than or equal to 10 years. The Chinese were born in the area (local people),

Table 2.4. Demographic profile of respondents and its extended family in Sebuku and Sembakung Sub-districts

			Sebuku	Sembakung	Total
1	Number of households (persons)		26	25	51
	Total member of households (persons)		134	141	275
2	Distribution of respondents by family size	1 – 4 person	0.50	0.36	0.43
		5 – 8 person	0.39	0.56	0.47
		> 9 person	0.11	0.8	0.10
	Average family size		5	6	5
3	Distribution of respondents by age	< 15 years	0.43	0.45	0.44
		15 – 64 years	0.57	0.55	0.56
		> 64 years	0	0	0
4	Dependency ratio[3]		0. 63	0.83	0.80

Source: BAPPEDA Propinsi Kalimantan Timur

[2] Nucleus family refers to family with parents (mother and/or father) and children. Extended family includes other member in the family such as relatives or house helpers.

[3] The dependency ratio indicates the number of individuals of working age in relation to the non-working age population (children and the elderly).

Table 2.5. Distribution of ethnics in Subuku and Sembakung

Ethnics	Family Head		Family members	
	Sebuku	Sembakung	Sebuku	Sembakung
Dayak agabag	25(0.49)*	20(0.39)	101(0.45)	88 (0.39)
Tidung	1(0.02)	5(0.09)		21 (0.09)
Chinese			1(0.004)	3 (0.01)
Flores			1(0.004)	1 (0.004)
Bugis			5(0.02)	
Timoresse				1 (0.04)
Javanesse				2 (0.09)
Total	**26**	**25**	**108**	**116**

* For Family-head, number in brackets refer to proportion to the number of households.
For Family-Members, they refer to proportion tom the number of family members.

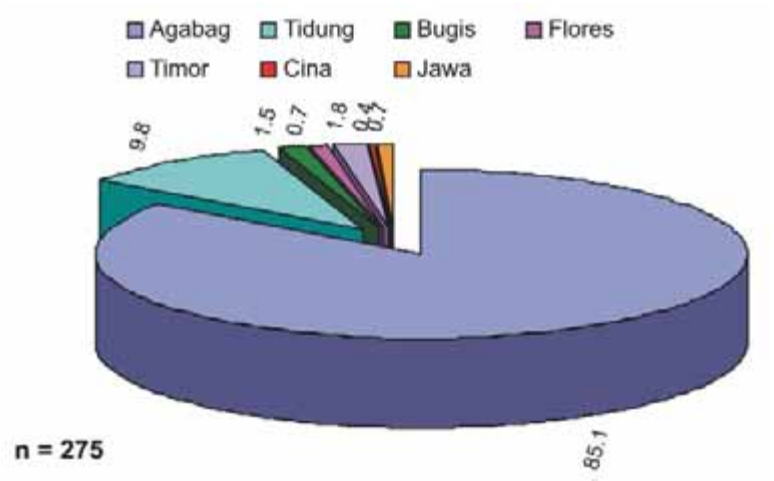

Figure 2.2. Distribution of ethnics in FORMACS study area

while people from Flores, Bugis and Timor are migrants who stayed in the area to find better living conditions; some used to work in Malaysia.

The level of formal education of respondents are relatively low. Around 35% of respondents never received schooling, only 4% received high school education and none above high school education.

Livelihood options

Agriculture activities are the main source of income for people living in the rural area of Nunukan. Especially those who live around the river where the soil is fertile. Activities that involve extracting non-timber-forest-product (NTFP) extraction are the next main source of income (Table 2.6).

Table 2.6. Level of education of respondents (in years of schooling)

Year of school	Proportion of respondents		
	Sebuku	Sembakung	All
≤ 6 years	0.85	0.64	0.75
> 6 years	0.15	0.12	0.37

Results of the household survey shows that only one respondent has non-agricultural activities as his main occupation (Table 2.8). Around 27% of respondents have off-farm activities as additional source of income, such as making boat, logging, opening a shop or as village official. Farming is still the main source of income for people in the study area.

Table 2.6. The main economic activities in villages of Nunukan

Activities	Products	Type of activities
1. Farming: crops	Cassava, banana, vegetables	Subsistence
2. Fishing	Fish (lampan, jelawat, pait, gedawang dan saluang), shrimps dan freshwater crabs.	Subsistence
3. Farming: livestock	Chicken and pigs	Subsistence
4. Gathering	Durian (*Durio zibethinus*), rambutan (*Nephelium lappaceum*), cempedak (*Artocarpus integer*), honey, gaharu[4] dan timber logging	Subsistence and commercial
5. Hunting	Deer and birds	Subsistence

Source: Monografi Desa-desa Kabupaten Nunukan (2001)

Table 2.7. Jobs carried out by respondents and their extended family

Job Categories	Specific activities
Farmer	planting crop based systems, tree-based systems or livestock
Teacher	-
Business Entrepreneur	opening small shops, selling timber
Village official	health worker, village office staff
Services	carpenter, swiftlet nests guard,
Logging activities	harvesting timber

[4] Gaharu is a fragrant resin that is produced by Aquilaria spp. (Thymelaeaceae) when subjected to fungal attack. Gaharu is also known as agarwood, eaglewood or aloeswood.

Table 2.8. Occupation of the head of family in the households surveyed

Job Type	Number of respondents		
	Sebuku	Sembakung	Total
Main Occupation			
Farmer	25 (98)	25 (100)	50 (99)
Teacher	1 (2)		1 (1)
Secondary occupation			
Trade	1 (2)	1 (2)	2 (4)
Village official	2 (4)	1 (2)	3 (6)
Services	1 (2)	4 (8)	5 (10)
Logging activities	2 (4)	2 (4)	6 (12)

* Number in brackets refer to percentage of respondents within each area

Only few respondents (4%) recognized logging activities as their secondary occupation. Nevertheless, around 55% of respondents acknowledge that they occasionally conduct logging activities and receive income from it. This information was derived when they were asked how much income they have received from selling timber from the forest (see section on Income).

A study by Kamelarczyk (2004) in Malinau District[5], East Kalimantan focus on the impacts of small-scale forest licenses, known as Timber Extraction and Utilisation Permits (IPPK = Ijin Pemungutan dan Pemanfaatan Kayu), on rural livelihood of three forest dwelling communities. The study revealed that the average estimate of households engaged in forest product harvesting are 46% timber harvesting, 70% for hunting, fishing 85%, gaharu collection 20%, rattan collection 35% and for fruits collection 47%.

Land tenure and ownership

In Nunukan, land is owned individually or through community (as communal land). Table 2.9 decribes the tenure systems of Dayak Agabag ethnic groups, that composed

[5] Before 1999, Malinau and Nunukan area belonged to the same district called Bulungan.

Table 2.9. Tenure systems and land allocation of Dayak Agabag community

	Land Ownership	
	Individual	**Communal**
Land Use Type	Settlement, Kebun and Ladang	Swiftlet (*Coccalia* sp.) caves, river and forest
Methods of obtaining rights	Opening forest, inheritance	Adat, community agreement
Land size	0.5 – 1.5 ha per household	10 – 10 000 hectares
Boundary Mark	Trees/plants	Natural boundary (river, hill mountain)

Source: Dokumen Amdal Kabupaten Nunukan, 2002

around 85% of the people surveyed. The household study, only focussed on the land owned individually by farmers.

Every household in the survey owned at least one plot. The highest number of plots owned by a household is 4 plots (2 respondents; Table 2.9). Sixty-three percent of respondents owned only one plot. The total number of plot surveyed is 75 plots.

Most of the plots were obtained by inheritance (Table 2.10), reflecting that most respondents are not new to the area (at least second generation). Opening land from forest is the next methods of obtaining the land.

Tabel 2.10. Distribution of plots owned by household

Number of plots	Number of Households		
	Sebuku	**Sembakung**	**Total**
1	19 (37)	13 (25)	32 (63)
2	6 (12)	10 (20)	16 (31)
3		1 (2)	1 (2)
4	1 (2)	1 (2)	2 (4)
Total Plots	35 (51)	40 (49)	75 (100)

* Number in brackets refer to percentage of plots.

Table 2.11. Methods in obtaining land

	Percentage of plots within each village		
	Sebuku	**Sembakung**	**Total**
Inheritance	49	45	47
Opening land	25	42	35
Purchase	3	-	1
Bequested	23	10	16
Sharecropping	-	3	1

Farming systems

Overall there are four main farming systems in the survey: rain-fed paddy, smallholder plantation, *jakaw* and agroforestry systems. Rain-fed paddy is the only crop-based systems found in the area, the rest of the systems are tree-based systems. Table 2.10 provides the general description of the tree-based systems.

There are two types of smallholder plantation: monoculture pepper and oilpalm. Oilpalm has only recently been introduced to the area and the trees are still in their early stage. The oil palm is mixed with upland rice.

Around 35% of the plots originated from forest, mostly opened into tree-fruit based agroforestry systems. This systems is also the main system that is currently found in the area, around 83% of total plots (Table 2.13), managed by 98% of households. The agroforestry systems combined coffee trees or fruit trees such as rambutan and langsat with annual crops such as long bean, maize and groundnut. The agrofrestry systems covered 63.1 ha or 71% of the total area of farming systems owned by respondents (Figure 2.3).

Most of the plots (69%) have semi-commercial purpose, serving household needs for own consumption as well as for providing income. Only less than 3% of farming systems have exclusively commercial purpose.

Average plot size in Sebuku is 1 ha while in Sembakung it is slightly higher at 1.4 ha. Land-holding size in Sebuku is 1.3 ha while in Sembakung is 2.16 ha.

Table 2.12. Characteristics of tree-based systems

Farming systems	Description
Smallholder plantation	Oil palm plantation, pepper (*Piper nigrum*) monoculture
Jakaw	A fallow rotation systems where farmers slash and burn logged-over-forest then plant upland rice for several seasons. When the yield are no longer acceptable, farmers will leave the plot to fallow.
Agroforestry Systems	A fruit-based systems, where farmers plant fruit trees in logged-over-forest between remnant trees of low-commercial values. During its early stage, farmers plant cassava or vegetables, such as long bean (*Vigna unguinculata*), chili (*Capsicum frustescens* and *Capsicum annum*), groundnut (*Arachis hypogaea*), melon (*Cucumis melo*), watermelon (*Citrullus lanatus*), *Brassica rapa*, eggplant (*Solanum melongena*).

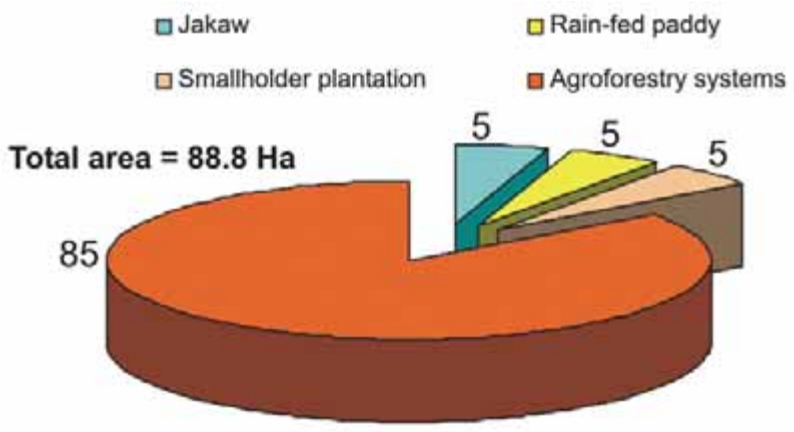

Figure 2.3. Distribution of farming systems by area (in percentage)

Table 2.13. Number of plots and average size of farming systems in Sebuku and Sembakung.

Farming Systems	Number of plots			Average plot size (ha)		
	Sebuku	Sembakung	Total	Sebuku	Sembakung	Total
Rain-fed paddy field	-	3 (4)	3 (4)	-	1.3	1.3
Smallholder plantation	1 (1)	2 (3)	3 (4)	2	1.5	1.7
Jakaw	1 (1)	6 (8)	7 (9)	1	0.6	0.6
Agroforestry systems	33 (44)	29 (39)	62 (83)	1	1.4	1.2
Total plots	35 (46)	40 (54)	75 (100)	1	1.4	1.2

* Number in brackets refer to percentage of plots.

Input and revenue

Input for farming systems are categorized into two components: labour and non-labour. Non labour includes fertilizer, pesticides and herbicides. In the study area, non-labour inputs are hardly used by farmers, except in smalholder plantations and several plots of agroforestry systems.

The total labour input for the farming systems in the study area ranges from 113 to 149 persons days year^{-1}hectare^{-1}. For tree-based systems, land preparation activities are required only at the beginning of the systems. Thus, the total labour input for these systems after the first year will be reduced by 23 - 36%. In tree-based systems, plot maintenance is the main component of labour input, ranging from 47 - 61% of the total labour input.

The labour requirement for harvesting and post-harvest activities in monoculture pepper systems seems to be under-reported. Pepper is

a plant that once mature will bear fruit continously. Thus, it is likely that harvesting activities are included as part of plot maintanance activities.

The oil palm systems, being in their the early stage, are planted together with upland rice. The amount of labour required for harvesting shown in Table 2.14 is for harvesting upland rice (see revenue derived from each systems in Table 2.15).

Table 2.15 shows a rough estimate of revenue derived from each systems and the fraction of marketable otput that will actually become hard cash earned by households. Only 3% of the plots in the study area has purely commercial purpose and around 46% has semi commercial pupose. Products like cassava and rice are mainly for own consumption.

Household income and expenditure

The main source of household income in Sembakung area is from on-farm activities (Table 2.16). The on-farm income is derived from marketable products only. Products that were consumed by households are not included.

For respondents in Sebuku, the sources of income are from on-farm activities as well as from forest. In Sebuku, income from forest contribute to around 56% of total household income, in contrast to 7% in Sembakung. This difference occurs because the quality of forests that exist in Sembakung is very low. Most of Sembakung forest has been exploited by a timber-concession or is being converted to oil-palm or industrial timber plantation, planted with *Acacia mangium* (CARE, 2005).

Tabel 2.14. Labour input for each land use systems (in person days ha^{-1} $year^{-1}$)

Farming Systems	Plot Preparation	Plot Maintenance	Harvesting and Post-Harvest activities	Total
Rain-fed paddy field	33	24	56	113
Jakaw (cropping phase)	36	77	24	136
Smallholder plantation				
Monoculture pepper	50	87	5	142
Oil palm	55	70	24	149
Agroforestry systems	27	70	17	114

* Number in brackets refer to percentage of plots.

Tabel 2.15. Revenue derived from farming systems

Farming Systems	Products	Revenue*) (Rupiah[6] $year^{-1}$ ha^{-1})	Fraction of marketable output
Rain-fed paddy field	Upland rice	2,640,000	0
Jakaw (cropping phase)	Upland rice, timber for own use	1,091,000	0
Smallholder plantation			
Monoculture pepper	Pepper	750,000	1
Oil palm (immature phase)	Upland rice, banana	505,000	0.88
Agroforestry systems	Upland rice, cassava, coffee, fruits, vegetables	1,964,000	0.75

* Revenue is defined as average yield of products derived from each farming systems, multiplied by estimated price. Products consumed by households are also included in the calculation.

[6] The exchange rate at the time when the survey was conducted was approximately Rp 8,900 per US$.

On the other hand, non-agricultural activities in Sembakung on average generated income 88% higher compared to activities in Sebuku. This shows different strategies between the two village in meeting their needs, influenced by existing resources.

The different livelihood options that exist in the two sub-districts studied influence the income per capita and income per household (Table 2.17). Sebuku has a higher household income and income per capita compared to respondents in Sembakung.

In Sebuku, two respondents received income from timber-IPPK fee; on average Rp. 1,250,000 per month or Rp. 15,000,000 per year. In Malinau (Kamelarczyk, 2004), a community living in a forest dwelling of Tanjung Nanga in 2001 received Rp 100 million in compensation for the timber extracted until 2000. The timber fee received by each households there ranged from Rp. 1,950,000 to Rp. 6,282,000.

The national indicator of poverty for rural area for Indonesia is Rp. 105,888 per person per month (BPS, 2003). While the regional indicator for East Kalimantan is Rp. 145,460 per person per month. On average, the income per capita for Sebuku and Sembakung village is above this level. But, looking at individual household, 4% of households in Sebuku is below the regional poverty indicator and 1% below the national poverty indicator. For Sembakung repondents, the percentage of households below the poverty indicator is higher, 44% below the regional indicator and 28% below the national indicator.

Around 46% of household expenditure is allocated for food. Transportation seems to be quite an important component of expenditure reaching 16% of the overall expenditure. Proportion of expenditure allocated to health is around 8%, unfortunately, similart to the proportion allocated to smoking. In terms of ratio of expenditure to income, around 33% of income is used for household expenses (Table 2.18). Despite the difference in average

Table 2.16. Household income by its source

Source	Sebuku		Sembakung		All	
	Fraction of households (%)	Average Income *) (Rp/month)	Fraction of households (%)	Average Income (Rp/month)	Fraction of households (%)	Average Income (Rp/month)
On-farm activities	**100**	**722,000**	**100**	**468,000**	**100**	**598,000**
Forest	**92**	**1,466,000**	**16**	**580,000**	**54**	**1,334,000**
Timber	*76*	*1,018,000*	*12*	*700,000*	*44*	*975,000*
Timber fee (IPKK)	*8*	*1,250,000*	*-*	*-*	*4*	*1,250,000*
NTFP	*60*	*791,000*	*8*	*110,000*	*34*	*711,000*
Fishing and Hunting	**4**	**150,000**	**20**	**103,000**	**12**	**111,000**
Other non-agricultural activities	**32**	**681,000**	**64**	**1,282,000**	**48**	**1,064,000**

* The average income is rounded off to the nearest thousands rupiah.

Tabel 2.17. Household income of respondents

	Sebuku	Sembakung	Total
Average household income (Rp/month)	2,299,000	1,288,000	1,804,000
Income per capita (Rp/person/month)	446,000	228,000	334,000

* Income is rounded off to the nearest thousands rupiah.

income between the two subdistricts the relative allocation or expenditure categories is the the same

Discussion

The household survey was intended to understand the livelihood options that exist in the forest margin of Nunukan. This understanding is crucial to recognize and comprehend the decision that farmers make to manage their landscape.

The result from two sub-districts in Nunukan clearly show differences in livelihood options, especially the quality of the remaining forest. Income of farmers in Sebuku is derived from on-farm activities and forest products, while for farmers in Sembakung the income is derived mostly from on-farm activities. Our current rapid study in two sub-district in Nunukan revealed that in an area where forest of good quality is still abundant, income generated from forest can contribute to 56% of household income.

Timber is certainly the most attractive forest product in the areas and logging is the most attractive off-farm activity. Logging activities also produced a higher revenue compare to on-farm activities. Existing literature provides hardly any information on the household economics of timber logging activities, although most literature does acknowledge logging activity (legal or illegal) a part of livelihood options for people living in the forest margin of Kalimantan (Levang, 2002). It is difficult to obtain an estimate on how much logging contributes to income at household level. Most existing literatures discuss the economics of timber logging, illegal or legal, at timber concession, regional or national levels (Casson and Obidzinsky, 2002; Resosudarmo and Dermawan, 2002 and Smith *et al.* 2003). The main discussion on legal logging is on management issues highlighting the importance of sustainable

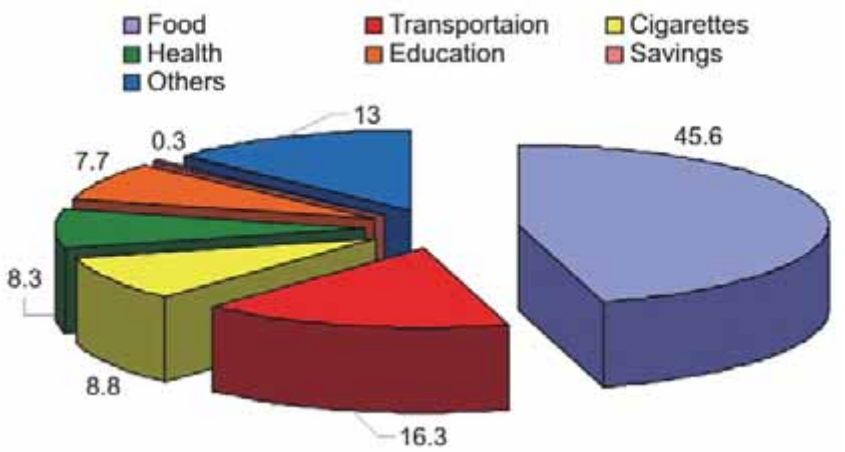

Figure 2.4. Household expenditure allocation in Sebuku and Sembakung

Table 2.18. Percentage of expenditure to income at household level.

	Sebuku	Sembakung	Total
	%	%	%
Percentage of food expenditure to income	14	17	15
Percentage of non-food expenditure to income	19	16	18
Percentage of total expenditure to income	33	33	33

methods for harvesting forest timber (Barr, 2002 and Sist *et al.*, 2003). The debate on illegal logging mostly addresses governance and policy issues, stressing the need of a better way to monitor illegal logging in order to recover the loss of local and national income that could be gained through taxes (Taconi, 2004). A careful study on household perspectives of logging and its economic contributions to household economy is required to develop alternative activities for income generation, as part of finding solution to maintain existing forest and reduce deforestation.

Conclusion

- The main farming systems in Sebuku and Sembakung sub-districts of Nunukan are fruit tree -based agroforestry systems, comprising 83% of farmers plots covering 71% of farming land and managed by 98% of respondents.
- Other farming systems found in the area are *jakaw* (fallow rotation systems with upland rice as crop), rain-fed paddy systems and smallholder plantation (oil-palm and monoculture pepper), in total managed by 29% of respondents.
- The return to land of agroforestry systems on average is Rp. 1,964,000 per ha, lower than rain-fed paddy systems. But given that agroforestry systems is the main system managed by farmers and 75% of agroforestry products are marketed, this systems is the main source of income from on-farm activities.
- Income per capita in Sebuku and Sembakung is Rp. 446,000 and Rp. 228,000, respectively per month and the average income per household is Rp. 2,299,000 and Rp. 1,288,000 respectively.
- In Sebuku, forest products contribute 56% of household income, in contrast to 7% in Sembakung. The additional income generated by forest products in Sebuku increased average household income by 78% and increase income per capita by 96%.