Economic value of non-timber forest products among Paser Indigenous People of East Kalimantan

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Table of Contents

Chapter 2
Theoretical context towards valuation of environment and tropical forest ecosystem

Chapter 3 Methods and research framework
How is the economic value of non-timber forest products measured?

Chapter 4 Research area
Pasir District, the district of forest or oil-palm?

Chapter 6
Non-timber forest products economic values in research villages

Chapter 7

The comparison of NTFPs economic value in villages economy

Chapter 8

Non-economic aspects of forest values

Chapter 9
Synthesis and recommendations

List of Tables

List of figures

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Leiden, **September 2011** Bernaulus Saragih

Chapter 1 Research Background

Non-timber forest products: a neglected resource in forest management

1.1 Introduction

Trees have been used by people for many purposes throughout history; to build shelters, make tools, smelt metals, provide warmth, cook food and construct homes. Each of these activities results in a reduction of tree cover. When the human population was smaller and more stable than it is at present, and technology was less advanced, this reduction had relatively little impact on the resource as a whole. Natural processes of regeneration were able to counteract the effects of this continuous harvesting, and the nomadic nature of human lifestyles over the centuries allowed the natural ecological balance to be largely restored. With the numbers of humans increasing and the forest being exploited for timber at much higher rates, this practice has become unsustainable.

The Department of Forestry of Indonesia (MOF) (2009) estimates that approximately 142 million ha of closed forest and woodland existed in Indonesia at the beginning of the 1970s, and by the year 2008, this had been reduced to around 112 million ha (a 20 per cent reduction in forty years), although it is difficult to determine such figures accurately. Especially in those areas that were allocated for shifting cultivation and conversion for agricultural development, there does seem to be clear evidence that forest conversion has been part of the 'natural' processes of development in various regions of Indonesia (MOF 2009).

Besides the conversion of forest for agricultural development, timber has been the major single product of Indonesian forestry since the late Seventies. Logging has been viewed as an opportunity to develop the country's economy and its importance is indicated by national efforts to regulate and develop the legislation to support this activity. The results of this is that timber processing industries and export grew faster in the late Eighties, and Indonesia became the main tropical plywood exporter to the global market at the beginning of Nineties. Finally, the income from selling timber and timber products was second only to Indonesia's oil and gas revenues between 1985 and 2001 (Ministry of Trade (MOT) 2006).

Timber has been viewed as the focus of forest management in Indonesia and, for more than 30 years, it has been the main cause of forest destruction, including the reduction of non-timber forest products (NTFPs) and the economic potential of the country's forests. The production of timber is well regulated and organised, and the markets for timber are highly visible and well established. The situation for NTFPs is different; there are few regulations, low visibility and incomplete production figures in terms of forest products statistics. This situation, along with the low contribution that NTFPs make to national revenues, has led many policymakers to perceiving them as minor products (ASMINDOO 2007).

However, NTFP's added value to the national economy has been long neglected. This is reflected in the national statistics of Indonesia from 1970 to 2000, which only record the economic value of rattan and its products. Forest fruits, animals and other products are neglected. Consequently, the economic value of NTFPs has a limited impact in determining policy decisions and for other government purposes. Despite this lack of visibility, there is no doubt that NTFPs play a crucial role in indigenous households in remote areas (Colfer et al. 1997; Godoy, Bawa & Pearce 1993; De Beer & Dermott 1996).

The tropical forest in the Province of East Kalimantan is one of the richest forest areas worldwide and harbours an enormous diversity of plant and animal species (Whitmore et al. 1990; MacKinnon et al. 1997). This province is also home to many indigenous peoples who are highly dependent on forest products (timber and non-timber forest products (NTFP) for their livelihoods. This includes the use of forest plants and animal products for subsistence and as a source of income (Weinstock 1981). This province is also a place where ancient wisdom has valued the conservation of nature for the benefit of mankind (Sardjono 1986; Colfer et al. 1995; De Beer & Dermott 1996; Menon 1986).

The role of NTFP in this province and its importance for the socio-cultural life of rural households has been studied by many researchers (most of these studies were conducted at the beginning of the 1990s). A regional focus for research has been the northern part of East Kalimantan (Colfer 1997; Fried 1997) and the Mahakam Basin River, (Grossmann 1997) and the central part of Kutai and CIFOR in the Malinau and Nunukan areas, as well as the west of Kutai (Matius 2002). These studies were gained in momentum following, or simultaneous to, the rise of NTFP studies in Latin America and some parts of Africa. Examples of NTFP studies from Colombia are: Dominguez & Gomez 1990; Galeano 1991; Van der Hammen 1991 and Rodriguez 1991. Examples of NTFP studies in French Guyana are: Van Andel 1998; Van Andel & Reinders 1999. In Ivory Coast: Bonnehin 1992; in Cameroon: Van Dijk 1999 and in South East Asia and Indonesia: Godoy 1986; De Beer & Dermott 1996; Valkenburg 1997 and De Jong 2002.

There are many other reports that are not published internationally, but which contribute to the understanding of rural people and their dependency on forests and forest products. However, the documentation on the economic value of NTFPs in Pasir District and, in particular, for the indigenous people of Paser is non-existent. This research is an effort to redress this and to collect data on the use of NTFPs and to assess their importance for the indigenous household economy. Its aim is to broaden the knowledge base on the economic value of NTFPs and their contribution to tropical forest sustainability in the Pasir District, in the southern part of East Kalimantan.

1.2 Valuation of forest ecosystem function

A fundamental aspect of forest economies today is the definition of appropriate economic values for the forest, its products and its environment. The effective capture of these environmental values facilitates the internalisation of negative externalities. At the same time, prices for forest resources can become more representative of their Total Economic Value, and environmental services will no longer be taken to be a free commodity. The objective of this chapter, therefore, is to identify which aspects of the forest ecosystem need to be included in this process of economic valuation.

1.2.1 The ecological functions of forests

Forests play a role in a number of important ecosystem functions and services. Within forests, vegetation supplies support for soil formation processes and influences its moisture content. Forests provide habitats for numerous plant and animal species and, in addition, make a significant contribution to the maintenance of global atmospheric conditions, by circulating gases such as oxygen and carbon dioxide (CO_2) through the process of photosynthesis. The following sections of this chapter address the ecological functions of the forest in East Kalimantan.

Some of the forest dependent species may play a crucial role in future human well-being, such as providing material for medicines, facilitating the potential breeding of pest-resistant strains of crops, or even to provide basic food resources. Without even considering the ethical questions involved in the conservation and preservation of these species, the economic arguments alone could provide adequate motivation for policymakers and other stakeholders to reappraise the way they use these valuable resources.

The total number of living species in the world has been estimated at between ten and one-hundred million, and approximately one half of all species live in areas that can be classified as tropical forests, even though this represents geographically only about 7 per cent of the earth's land surface (World Resources Institute 2008). Of the total global biome, only about 1.4 million species have actually been identified and described

(CIFOR 2009; Stuart et al. 2010), and far fewer have been analysed either chemically or genetically (World Resource Institute 2008).

The fact that approximately one half of all medicines is based on wild species, and that the output of prescription and non-prescription drugs from the world pharmaceutical industry has been valued at more than US$ 40 billion per year (CIFOR 2008), gives some indication of the economic potential that may lie within these forests. Looking only at the pharmaceutical potential of biodiversity, the current rate of species loss – approximately 1,000-10,000 species per year (UNDP 2004) – represents a significant potential loss to future human well-being. At this rate, it is estimated that half of all the species alive today could become extinct by the year 2050. Thus, tropical deforestation, the principal cause of biodiversity loss, is clearly a process not compatible with the accepted concept of sustainability and intergenerational equity.

An example to illustrate the economic importance of genetic materials for biodiversity is provided by the estimate of benefits gained from improvement of agriculture made as a result of the application of wild strains in crops and pest-resistant crops. Taking all agricultural production into account, the US Department of Agriculture estimated in 2006 that contributions from genetic plant material lead to productivity increases with a farm-gate value of more than US$ 1 billion annually (US Dept. of Agriculture 2006). There is little doubt, therefore, that without the utilisation of wild strains of plants found in natural habitat, significant outputs and production increases of the agricultural sector would not have been achieved in the past. Since any loss of such wild genetic materials will undoubtedly reduce potential applications for future generations, loss of tropical forests, which are home to more species than any other ecosystem, should be prevented if global sustainability is to be achieved.

1.2.1.1 Forest and climate change

The role of tropical forests in mitigating climate change has been addressed in various international conferences and seminars. One important meeting taking place in Indonesia, was the Bali Conference for Climate Change (COP1) in December 2007. This conference again raised the issue of increased CO_2 constitutes in the atmosphere, which has been identified as one of the causes of the conversion and destruction of tropical forest (Ministry Of Environment (MOE) 2008). The current concentration of CO_2 in the atmosphere is 357 parts per million by volume (ppmv), compared with 280 ppmv in pre-industrial times (IPCC 2007). Because of this change in the level of atmospheric CO_2, which is currently increasing at 0.5 per cent per annum, concern has grown about the possibility of long-term changes in global climate patterns. Approximately 40 per cent of CO_2 emissions resulting from human activity remain in the atmosphere over the longer term (Wuebbles & Edmonds 1991; IPCC 2007). This indicates that atmospheric changes are likely the result, at least in part, of human action.

The role of forests in relation to atmospheric CO_2 is twofold. Growing forests absorb CO_2 into their cellular structure, forming a store of carbon. When these forests are cut down, this stored carbon is released into the atmosphere as CO_2. Deforestation is thought to be a major cause of emissions (Houghton et al. 1991). Because of the high biomass of flora and fauna in moist tropical forests, these areas function as a carbon sink, along with the oceans, the atmosphere and fossil fuels. Estimates of the value of this total global biomass pool are in the range of 550-830 billion tons of CO_2 (Bouwman 1990), and since forests contain possibly as much as 85 per cent of global biomass of carbon (Sedjo 1992), changes in the level of forest cover will have an effect on both emissions and absorptions of CO_2. As a result of the sequestration potential of re-growth, it is theoretically possible to develop forestry policies that support sustainability, but which still allow a degree of forest harvesting. To achieve this, more detailed data from both the natural and social sciences is required (COP13 2008).

Attempts to quantify the effects of deforestation on climate change have been made by Mc Kinsey (2009), modelling data from the Intergovernmental Panel on Climate Change (IPCC). These models suggest that a total halt to deforestation by the year 2020 would result in a 6 per cent reduction in both global warming and in rising sea levels, compared with the base scenario used by the IPCC, which assumes no policy on deforestation. To achieve the same degree of reduction in climate change by reducing methane emissions, the projected level of such emissions would have to be reduced as much as 50 per cent. Although the zero deforestation scenario used in this model is an extreme case, and one which is unlikely to be achieved, it does indicate that policies to reduce deforestation are, to some degree, likely to have a beneficial effect on anticipated global climate change.

The value of this carbon sequestration function of forests is another aspect of forest values that has previously been ignored by policymakers. Only recently has it become a focal point of discussions within the UNFCCC. Recent research, such as Martin (2010), suggests that the carbon storage value of forests far exceeds the extractive values of both timber and non-timber products. This value has been computed on the basis of the assumption that the human impact on climate change is a real phenomenon, and that costs associated with atmospheric carbon build-up can be realistically calculated. Estimates of sequestration values depend on the type of forest and on the subsequent land use following conversion. The value of carbon storage function of tropical forests ranges from between US$ 600 to US$ 4,400 per ha (Martin 2010). If such sequestration values were to be included in the calculation of the Total Economic Value of forests, investment decisions on alternative land use options may well result in different outcomes.

1.2.1.2 Soil protection, flood prevention and water collection

Forests plays a key role in the structure of the earth's surface. Roots of most types of trees penetrate into the ground and spread out, providing anchorage points for soil to collect and solidify. When these are cut down, roots rot away and the supportive fibres can no longer provide stability to the soil. Very quickly, rain and surface water run down amongst the roots, soon eroding the soil and washing it away. This is a particularly serious problem in tropical forests, for two reasons: Firstly, the soil in such areas is often very shallow, and so, in a very short period of time, little soil is left to support any form of vegetation. Secondly, in tropical areas, rainfall patterns are such that large volumes pour down in a short time, greatly exacerbating the effects of soil erosion (World Bank 1992).

A number of studies have attempted to look more closely at the relationship between the removal of forest cover and the loss of important ecological functions and services. In Zaire for example, a period of rapid population growth brought about severe deforestation in some areas (mostly as a result of fuel wood cutting and land clearance for crops), and as a result, soil erosion and declining soil fertility occurred (WRI 1995).

It has been shown that as deforestation occurs, accelerated run-off resulted in localised flooding and reduced hydrological cycling (Bruijnzeel 1990). Sedimentation in water bodies and rivers is a problem created by the loss of the ecological functions of forests. This occurs as soil is washed into water courses and contributes to the likelihood of flooding, as well as the disruption of water supplies further downstream. In addition, it creates problems during the process of purification of water for home consumption, as the concentration of particulate matter to be removed is far higher than would normally occur. In Mexico, the amount of sediment produced annually by soil erosion has been estimated at 365 million tons, with 31 per cent of this being deposited in the water catchment area before reaching the sea (Martinez-Menez & Fernandez 1984). If this water is not caught in man-made reservoirs, which often act as a sink, and high levels of sediment-filled water reach the sea, then serious siltation of estuaries and ports can occur, obviously having a negative external effect on inland and coastal navigation.

Flooding caused by deforestation has been observed in a number of locations in the world, especially downstream from hilly areas in countries such as Indonesia and the Philippines. Incidences of flooding and soil erosion have been observed in Sumatra and Java and, notably, soil erosion and landslides killed many people in a number of provinces in Central and East Java in January 2006 (*Kompas, January 2006*). Suggestions on how to prevent this type of problem have included a reduction in the rate of trees being cut, and extensive reforestation programmes.

Attempts have been made to quantify the degree of soil degradation and sedimentation damage, but this is very difficult due to the various types of forest formations and the difficulty in identifying the exact source of sedimentation. There are many seasonal differences in rates of sedimentation, for example in areas where rain falls more heavily in some months than others, during wet months more material is likely to be dislodged than in the dry months. This problem of soil erosion and sedimentation also manifests as landslides in hilly areas, as can be seen frequently in the Philippines, Colombia, Indonesia (Java) and other areas where deforestation is taking place on mountainous terrain.

According to the World Resources Institute (2007), 41 per cent of the soil degradation in Latin America is the result of deforestation, while in Asia the figure is 40 per cent. In North America, however, only 4 per cent of soil degradation is the result of deforestation. One of the main reasons for this low figure in North America is the type of agricultural activities. On that continent, rates of deforestation are generally much lower than in tropical areas. In the case of Europe, although the net amount of forest cover is increasing, deforestation still occurs in some areas, and the amount of soil erosion resulting from this is estimated to be 38 per cent of the total (WRI 2007).

The social costs of soil degradation and the loss of other ecological services of forests in Mexico has been estimated at (a final lower bound figure) US$ 4 billion (Adger et al. 1995). Although it may be possible to criticise the methodology of such estimates, there is little doubt that forests have important ecological functions, and by removing the trees and other flora, these valuable functions will be lost.

There has been a study of a lesser-known ecological function of forests in Northern Chile (Schemenauer & Cereceda 1994). Estimates were made of the water collection potential of high altitude forest, and it was found that significant amounts of water per day could be collected from such locations. This is made possible by the fact that at certain high altitudes, meteorological conditions result in frequent and extensive fog and mist extending over forested areas, and the trees and other vegetation act as 'condensing agents', causing the water droplets in the fog to drip down into the soil. With the construction of appropriate collecting devices, this water can be tapped for irrigation and consumption in lower altitudes areas. It is interesting to note that such water collecting devices have been found in Inca Pirca, in Southern Ecuador, dating back to the Inca civilisation in pre-Colombian times, and these are still in use today. Other contemporary tribes in the mountains of Northern Colombia rely on similar traditional methods as the source for their water, and have expressed concern to the UN at the changes in meteorological patterns affecting their water supplies.

Other examples of studies where ecosystem functions have been undermined by deforestation include studies in Tanzania (Kaoneka & Solberg 1994), Thailand (Muttamaran & Sales 1994) and India (Das et al. 1994). In all of these cases it has been shown that deforestation has been a major factor in bringing about soil erosion, sedimentation and flooding. Overall, the local, regional and global impact of the systematic reduction of forest cover is having a significant negative impact, both on major world ecosystems and on large numbers of the world's people.

1.2.2 Products from tropical forest

Tropical forest provides a large variety of products that are useful to humans, in terms of both timber as well as non-timber forest products. The latter include food products such as fruits, nuts and fungi, and of course protein from animals, fish and birds. Trade in wildlife can also be used for income generation, as can trade in decorative plants, such as orchids and bromelias. A range of fibres and resins are found in the forest ecosystems, and these have importance applications in the production of a wide variety of paints, dyes and cosmetic products. Among the most important and valuable of non-timber forest products are pharmaceutical materials, from both plants and animals.

1.2.2.1 Timber production from forests

Since Indonesian independence in 1945, forests have been viewed as great potential for national economic development. Timber has been a major construction material in most parts of the country. Although politicians have been conscious of the depletion of the resources, it is only recently that more attention has been paid to the introduction of policies that promote more long-term sustainable development of forest. Between 1970 and 1985, the timber industry in Indonesia consistently exported all types of unprocessed round timber or logs. One of the tragic results of this was massive forest destruction and subsequent loss of forest functions and services (including, e.g. increased soil erosion). In addition, fires swept over huge areas of Kalimantan, devastating as much as 3.2 million hectares of forest in 1982 and 1983. These fires were the result of burning the land after logging; a way of preparing the land for agriculture. It was not until the end of the 1994 that it was recognised that the formerly forested areas were not very suitable for agriculture. Subsequently, there has been a slow reversion back to forest.

Today, the result of this short-term profit-maximizing approach to forestry can be seen everywhere in Indonesia. In Sumatra and Kalimantan more than half of primary forests have been exploited (CIFOR 2007). Most timber concessions have gone and the production of timber from natural forest has been reduced from 11 million m^3 in 1979 to 5 million m^3 in 2000 for East Kalimantan alone. Fast-growing species of timber are expected to become the main source of timber production in the near future. In many tropical forest areas the traditional hardwoods, such as ebony and mahogany, are almost extinct, and other species are to take their place, to meet the hardwood demand. In most of the Indonesian forested land, timber extraction took place at an equally rapid rate. Fortunately, however, the low level of technology applied to lumber meant that some natural regeneration occurred in most areas. Government policy encouraged reforestation projects, such as '*menanam sejuta pohon*' or 'planting a million trees', in the areas of land under forest management programmes. In addition, lowering the national timber production quota has also reduced the deforestation rate to its current level of 1.8 per cent, from 2.2 per cent in 1994 (MOF 2006).

The rate of global expansion of timber and industrial wood products, including paper, peaked in 1973 and then levelled off at about 1.5 billion m^3 per year (FAO 1986). Although the use of timber in construction worldwide has slowed down, (as substitute building materials have been introduced), paper consumption continues to increase, especially with the expansion of office technology (ITTO, 2006). Major importers are predominantly developed nations, with Western Europe, Japan, China and the US accounting for a total of 76 per cent of imports by value. Since 60 per cent of world exports of timber and pulp come from managed softwood forests in temperate zones, a large proportion of this timber demand can possibly be met on a sustainable basis. With respect to tropical forests, however, Malaysia and Indonesia rank fifth and sixth, respectively, as exporters of timber on the world market; a worrying statistic given the fact that few forests in those areas are managed in a sustainable way under current Forest Stewardship Council (FSC) certification schemes (CIFOR 2007; ITTO 2008).

Table1.1 The relation between stumpage fees and reforestation costs

Country	Percentage of reforestation costs covered by stumpage fees
Niger	1.0
Senegal	2.0
Sudan	3.5
Ivory Coast	11.0
Kenya	13.5
Ethiopia	22.0
Indonesia[1])	16.0

Source: World Bank (2004); MOF (2006)

When the cost of replacing forests is compared to the sums paid by loggers to harvest them, it is evident that the stumpage fees, or royalties, paid by logging companies to governments for the right to extract the timber, are usually much lower than the estimated cost of replanting the forest. This is illustrated in table 1.1, which indicates the importance of the introduction of more sustainable management practices in tropical forests. If logging companies are made to pay more realistic fees for the rights to extract timber, the possibility of reforestation programmes to replace harvested timber will be a more practical probability. If this is accompanied by longer-term concession agreements, loggers are more likely to take better care of the forest resource.

1 This is based on the reforestation fee of extracted timber of US $16 per cubic meter and the domestic timber price of $100 per cubic meter.

1.2.2.2 Forests as a source of energy

As a milestone in human development, the use of fire began the onslaught on global forests, and the widespread introduction of iron, steel and steam during the nineteenth century gave rise to a rapid increase in the demand for charcoal and fuel wood. The growth of international trade and use of steamships, which took this demand to all parts of the world, resulted in millions of square kilometers of North American forests being logged, with coastal areas of many parts of Africa, Asia, South America and Australia suffering the same fate (Williams 1982). With speedy profitability being the main motive for timber companies, 'a cut out and get out' philosophy was adopted, often resulting in the clear-cutting of forests. Similar developments have occurred more recently in Kalimantan.

The total production in East Kalimantan alone reached its peak in 1979, with 11 million m^3 of timber being produced. A major factor in the economic losses of this region has been that all this timber was being exported without further processing and, therefore, no added-value to be gained by the country. The total timber exported from East Kalimantan in the period 1970 to 1985 (before industrialisation) reached a volume of 150 million m^3 (Saragih 1996).

The FAO estimates that 53 per cent of global wood production is used to generate energy in the form of cooking materials. Hence, forests provide the primary fuel source for 70 per cent of families in developing countries. There is little doubt that, in the past, most of the forest area in industrialised countries has been cut for construction and fuel wood. It is estimated that, at present, as many as 2 billion people in the world are dependent on wood for energy (FAO 2006) and in these cases, a total of $0.45m^3$ is needed for one person per day (Arnold & Jogma 1998). This reflects the strong demand for fuel wood, and in some African countries as much as 90 per cent of all energy is provided from timber sources (CIFOR 2006). In Asia, only 42 per cent of fuel comes from wood, while in Latin America the figure is only 30 per cent (Dunkerley & Ramsey 1983). These figures suggest that the fuel wood problem is greatest in Africa, while in other areas the cutting of timber for cooking and heating is likely to have a much less significant effect on forest cover.

In many countries this has had serious consequences for the rate of deforestation and, as a result, forests have been thinned and depleted, soil eroded, habitat lost and flooding has occurred. In addition to problems arising from general population growth, an imbalance in regional population distribution also creates fuel wood problems. For example, in the Kano province of Northern Nigeria, the demand for fuel wood is five times greater than the supply, whereas in other areas of the country a surplus of fuel wood exists (Williams 1992). Since the Seventies, the total global production of fuel wood and charcoal has risen from about 1,200 million m^3 per annum to over 1,600 million m^3 per annum, with more than 80 per cent of this production and consumption taking place in developing countries (CIFOR 2006).

In a number of nations, the quantity of fuel wood demanded is consistently larger than the supply. The effect of this is to create a situation of continuously increasing prices. This is demonstrated by the increasing prices of fuel wood in many parts of the world, such as Nepal, Bolivia, Peru, Haiti, Turkey, Ethiopia, Sudan and India (FAO 2003). The same pattern is also found in East Kalimantan where the price of fuel wood has increased by 150 per cent in the period 2001 to 2005 (BPS Kaltim 2006). The impact of increasing prices is made worse by the fact that the majority of people in these areas, who are consuming this fuel, are from very low income groups who cannot afford an alternative available substitute, such as kerosene. This is illustrated by a study of Western and Sub-Saharan Africa (Anderson & Fiswick 1984), which shows that in virtually all areas of the region, the quantity of fuel wood demand regularly exceeds available supplies by between 30 and 200 per cent and, as a result, the price rapidly increases. Wood has now become so scarce in some areas that it often consumes between 20 per cent and 40 per cent of the total cash income of urban households, and this is more than the expenditure on food. In Nepal, women and children can spend as much as 100 to 300 days per year per household collecting and transporting fuel wood (FAO 2006), a situation which is clearly already unsustainable, given indications that the supply of wood is unable to meet demand, except at higher prices. Increased prices are often a direct result of an increase in the time taken to collect fuel wood. This implies that less time is available for those family members to participate in food production and other activities, eventually reaching a point where it is simply not feasible to collect fuel wood.

The collection and burning of fuel wood is essential for billions of people worldwide and represents a total of 1,408 million m^3 of wood, equal to 65,000 km^2 of woodland, each year (FAO 2006). Even with the introduction of efficient stoves and changes in dietary practice, the demand for fuel wood is set to continue to rise as the human population grows. Thus, the main problem is that increased consumption results in unsustainable levels of extraction of fuel wood. Furthermore, it appears unlikely that this problem will be solved without extensive reforestation programmes and the introduction of community participation in forest management schemes (CIFOR 2006).

1.2.2.3 Non-timber forest products

Conventional economic analysis of forest resources has often tended to ignore non-timber products (NTFP). This is illustrated by some older publications by the FAO (1982, 2006), although more recent editions have attempted to include such data. Non-timber forest products include any kind of fruit, nuts, honey, bark, roots, fungi, resin, animal products or organic chemicals that originate in a forest ecosystem. All forests, in both temperate and tropical areas, have some non-timber products, but because of the huge range of plant species found in the latter, the importance of these 'by-products', and the economic potential, is much greater in tropical forests. One major advantage of viewing these products as potential income generators, is that they can usually be harvested without major damage being done to the ecosystem. In addition, the methods of collection of such products are inevitably labour intensive, and this often means that they are appropriate to the surplus-labour situations found in many tropical forested areas. Furthermore, since indigenous forest peoples are usually familiar with these types of product and the methods of collecting them, they are well suited to, and skilled in this type of work.

When taking all of these diverse forms of income generation into account, the potential from non-timber products could be very large, and the actual economic value that they currently have is also very significant. For example, in Malaysia it is estimated that there are over 1,250 non-timber plant species used by humans, representing about one sixth of all known species in the area (Jacobs 1982). Extrapolating this proportion to the entire area of global tropical forests suggests that as many as 15,000 plant species in these areas could have potential for material or medicinal use. Looking at individual products, we get some idea of the commercial potential of this type of product. Rattan, as a species of climbing palm, prolific in many forested areas, is used extensively in the production of furniture, mats and baskets. In Indonesia alone, export of rattan amounted to US$ 350 million in 2006 (MOT 2007), while patchouli oil and other related non-food oils earned US$ 48 million per annum for that country (Tceknavorian-Asenbauer & Wijesekera 1992; De Beer & McDermott 1998). Indonesia in particular is quite advanced in its exploitation of non-timber forest products and, in 2007, the total value of the export of such products (mainly rattan, bamboo and crafts) from that country amounted to US$ 400 million (MOT 2007).

At the household level, non-timber forest products are also important as a source of food. Although the individual monetary value of such minor food and drink products may be relatively low, their importance must not be ignored due to the fact that they provide an important source of vitamins, proteins and minerals to the household diet. The examination of the nutritional value of forest foods used by Amerindians in Venezuela by Melnyk and Bell (1996), suggests that the high nutritional content of such foods makes a significant contribution to the health of forest dwelling people. Colfer (1986) examined the role of forest plants for medicinal purposes in the village of Long Segar, East Kalimantan and concluded that as many as 127 plant species were used for preventative healthcare and for curing diseases by traditional healers. WWF (2003) reported the use of plants by the people of Lundayeh in the Kayan Mentarang National Park of East Kalimantan. The Lundayeh people used 58 species of plants for building materials, 53 species for edible foods, 36 species for fuel wood, 52 species for traditional medicines and 47 species for various tools and equipment. Studies in Africa have demonstrated the nutritional importance by identifying that vitamins A, B2 and C are supplied by many forest food products (Becker 1983), and they have pointed out that such products are also used widely to add flavour and variety to staple foods (Ogle & Grivetti 1985). Work in Malaysia (Caldwell & Enoch 1972) has shown that wild leaves of forest plants contain three to four times the amount of riboflavin compared to domestic leaf vegetables, and greater amounts compared to nuts, fish, milk or eggs. Recognition of the important nutritional role played by forest food products has been further illustrated by the FAO (1992) and the International Institute for Environmental Development (IIED 1994).

In addition to food plants, forests provide an important source of protein through the extraction of wild meat and fish. In Northern Zaire, it has been estimated (Mbaelele 1987) that fish and bush meat provide 95 per cent of animal protein for both rural and urban dwellers. In other parts of Africa, research has suggested that, although the figures may vary per region, protein from wildlife plays an important role in household diets. In southern Nigeria, for example, research by Ajaye (1979) suggested that 80 per cent of the village households consume bush meat while in Sierra Leone (Smith et al. 1979) and 55 per cent of village households regularly use bush meat. A study by Grossmann (1997) in the central part of East Kalimantan revealed that 35 per cent of protein meat in two villages under observation was provided by the wild animals hunted from the forest areas. From this it seems clear that for people living in forest areas, the consumption of meat and fish has real importance, and one on which, realistically, a monetary value can be placed. A further consideration here is that forest foods also provide a crucial role for those households suffering during the economic hardship. Given the example of marginal difference in productivity between subsistence and starvation in many different households (Ogle 1984), this suggests that minor forest food products have an important role to play in food security within forest communities.

In addition to the many products and services already mentioned, another dimension of the benefits arising from forest use can be attributed to income from the export of plants and exotic flowers, handicraft items produced by forest dwellers, and from the produce of saleable services for the purposes of ecotourism. To gain a truly holistic assessment of forest values, all of these need to be considered, and if we fail to include them in the analysis of forest potential, we reduce the chances of achieving a sustainable system of management of the forest ecosystem.

1.2.3 The problem of deforestation

Tropical forests account for about 50 per cent of global forest cover (FAO 2006). They can be further subdivided into dry and moist forest, and of the moist forests rainforests account for two thirds, while the rest is deciduous. Deciduous forests are usually on the edges of the rainforest, and are characterised by more distinctive wet and dry seasons. Although there is also serious depletion in the dry forests, the rainforests are considered to be a more pressing concern, as they are by far the richest in terms of biomass and biodiversity. There have been many studies examining the various causes of tropical deforestation, but no clear consensus has yet emerged as to a single major cause, except for the consideration that deforestation is the result of undervaluing of the resource itself. The main reason for this undervaluation is because many of the products of the forest ecosystem are traded in informal markets, and little data exist enabling a rigorous examination of these markets. Furthermore, most of the valuable ecosystem services provided by such forests have been considered as 'free goods', and are not traded in any way (Durning 1993). This perception of the services of tropical forests as a free good is something that must be changed if the current rate of deforestation is to be slowed.

1.2.3.1 Link between poverty and deforestation

An exploration of the link between forests and poverty has been undertaken in the last two decades. The research of Durning (1989) and the CIFOR study in 2003 have suggested that deforestation will be worse in situations of extreme poverty, such as in Rwanda, but that this is not always the case. In some poor countries, such as Sri Lanka, the rate of deforestation has been slowed down significantly, in spite of widespread poverty, as a result of the introduction of forest management techniques. In Nepal, though poverty is extreme, deforestation is down to 0.8 per cent per annum from an original rate of 1.4 per cent; a significant decline from previous levels. This has been achieved (through necessity) as a result of strict government control (FAO 2006).

In other poor countries, such as Zaire, the figure for deforestation is still worryingly high (Durning 1993) and probably the result of a combination of permitted and illegal logging activities, as well as rural encroachment on forest margins. In spite of this high figure, the deforestation rate in Mexico is three times higher than that of Zaire, even though Mexico is a much more affluent country (FAO 2003).

It is notable that the worst deforestation rates have occurred in the past in Latin America, and to some extent this reflects the lack of government control and probability of corrupt practices being used to allow logging to take place unchecked. In relation to Brazil, this is confirmed by research (CIFOR 2003), which suggests that sustainable forestry management on a commercial scale was non-existent in the Amazon. However, these data also indicate that in areas of high population pressure, such as Brazil, Indonesia and Mexico, deforestation rates are likely to be higher than in areas where population growth is slower. It is clear that there are links between poverty and deforestation rates, but the various factors causing the links need to be examined further (Angelson & Wunder 2003).

1.2.3.2 The role of agriculture in deforestation

CIFOR (2003) concluded that 60 per cent of all deforestation results from the expansion of agricultural settlements, and there have been many studies conducted to investigate the role of agriculture in the deforestation processes. Forest farmers (estimated worldwide to be over 140 million) may occupy over one fifth of the forest area. Taking into account the family size, which is typical for forest farming groups, and the forest clearance associated with adequate food production, it is reasonable to conclude that as much as 200,000 km^2 of primary and secondary forest are being cleared each year to maintain current subsistence levels amongst forest dwellers (Myers 1980; CIFOR 2003).

In contrast to this, a further examination of the relationship between farmers and forests has revealed some interesting issues. For example, the assumption of a simple linear relationship between population growth, agricultural expansion and deforestation has been questioned (CIFOR 2003). It is also claimed that much of this type of deforestation is the result of the production of lifestyle related products, such as stimulants, sugar and tobacco. This suggests that to put the blame for deforestation solely on shifting cultivators in less developed countries may be a mistake.

In another study (Burns et al. 1994), rural encroachment on forests is seen to be an important factor leading to deforestation. This is also the case for economic decline, since it has the effect of driving people into marginal land when alternative employment opportunities disappear. On the other hand, growth of service industries and secondary education seem to have had the opposite effect. Burns' study used a world system theoretic perspective, and is based on structural equation models that are used to identify direct and indirect effects on deforestation. According to the study by Burns et al. (1994), areas currently most at risk from deforestation are at the periphery and semi-periphery of the forest. Overall, it is clear from all the studies that the causes of deforestation vary considerably in different parts of the world.

1.2.3.3 The role of macro-economics in deforestation.

Various types of economic and social policies have been blamed for deforestation. Policies on transportation, rural development, taxes and royalties on timber harvests, the promotion of domestic processing industries, and agriculture, have all had an impact on land use in tropical forests. An examination of these policies has been undertaken using a general equilibrium framework by Deacon (1995). It was found that many policies in developing countries, which were designed to encourage the development process in general, tended to increase rates of deforestation.

A more detailed investigation (World Bank 2006) found that in Indonesia taxation policy resulted in price distortion, to the extent that companies could bear production costs 2.5 higher than overseas competitors and still be viable on the world market. The direct impact of this on the forests is detrimental, since Indonesian plywood production consumes 15 per cent more raw material per unit of output than similar industries in neighbouring countries.

In Malaysia, the policy of assigning logging rights across huge areas of forest has created monopolies within the timber industry. Market failure leads to private profit maximising firms 'mining' the resource for short-term gains, rather than following a more sensible long-term policy. A major side-effect of this is the severe degradation of the forest disruption of the social and economic structure of indigenous forest dwellers (Heyzer 1995), such as the Penan and Kelabit peoples in Sarawak. It seems that while some economic policies may be more damaging than others, government policies in several countries have contributed in a positive way to the non-sustainable use of tropical forests.

1.2.3.4 Property rights and deforestation

The role of property rights in the deforestation process has been examined by several authors (Mendelsohn 1994; Deacon 1994; Minter, 2009 a.o.) and it appears that when land tenure is even slightly insecure, resources will be used in a non-sustainable way. This result appears to be confirmed in a cross-sectional study of 120 countries (Deacon 1994) that also showed that government instability, and the inability to enforce ownership rights, led to insecure land tenure and consequent deforestation.

In many parts of the world, forested areas have traditionally been viewed as common property resources, with free access to all. This works well when a strong social structure and the systems of traditional practices exist and impose a discipline on the inhabitants of the area (Dove 1994; De Jongh 2002). This discipline has traditionally been the means by which natural balances can be maintained and restored, and in some societies these practices still continue. Examples of this can be seen in the Kayan Mentarang National Park of East Kalimantan with the Lundayeh community and the people of Dayak in Mahakam (Matius et al. 2003; Grosmann 1997; Colfer 2008). It is with such groups that the issue of land tenure is creating a serious problem today, as population pressure is making it more difficult for these groups to exercise their traditional land use rights. This results in the loss of significant benefits both now and in the future.

1.3 Research framework and objectives

This research was developed in the framework of the Tropenbos Kalimantan Programme and the Trade-off of Biodiversity Project in Gunung Lumut Protection Forest and Extension Area of Pasir District, East Kalimantan. The Trade-off Biodiversity Project was developed with the aim to formulate recommendations on the integration of forest exploitation timber and non-timber forest products serving local people and biodiversity conservation.

This research project was developed following an agreement by Tropenbos International, the Institute of Environmental Sciences (CML), Leiden University and the Faculty of Forestry of Mulawarman University, Samarinda, Indonesia. Funding from NUFFIC, under the Netherlands Fellowship Programme (NFP), has made this research possible in the period 2004 to 2008.

The research began in January 2004 with a visit of staff of the Institute of Environmental Sciences Leiden (CML) in order to prepare a research proposal and to obtain the approval of the supervisors. This was followed by data collection in the Pasir District between 2004 and 2007. Field research was interrupted by annual three month visits to CML, Leiden University, during 2004 to 2007. The finalisation of this dissertation was conducted between 2008 and 2010.

1.3.1 Research objectives

In order to address the research issues and to contribute to the formulation of recommendations on the integration of forest exploitation timber and non-timber forest products serving local people and biodiversity conservation, three research objectives were formulated:

(1) To study the economic value of non-timber forest products for households of Paser indigenous people

(2) To determine the factors influencing the extraction and marketing of NTFPs in the research area

(3) To develop possible interventions by synthesis and recommendations

1.3.2 Research questions

To rightly assess the economic value and factors influencing the use of NTFPs in the research area a holistic approach is required. Such a holistic approach requires answers to the following questions:

(1) What is the dominant NTFP used by the indigenous people of Paser?

(2) What is the economic value of NTFPs for indigenous Paser people?

(3) What are the factors influencing indigenous people's use of NTFPs?

(4) What is the actual and potential extraction of relevant NTFPs in the forest research area?

(5) What are the most relevant local frame conditions influencing NTFP exploitation?

(6) To what extent can the cultivation and collection of NTFPs change the biodiversity values of forests?

(7) How far can current conditions be influenced in order to improve local people's income from NTFPs?

1.4 The organisation of this book

This book is divided into nine chapters. Each chapter is started with a short introduction, followed by the objectives and the methods of data collection. Chapter one discusses the introduction to this research and consists of background research and the important functions of forests for both environmental and economic aspects. It concludes after a description of the research objectives and questions. Chapter two discusses the theoretical context regarding the valuation of environment and tropical forest ecosystems. It begins with an introduction to the foundation of environmental valuation and is followed by a discussion of the total economic value, and some determination of the natural resource values. Methods and general problems in valuation methods are also discussed in Chapter two, which closes with endnotes that summarise the overall discussion.

Chapter three discusses the methods used to measure the economic value on non-timber forest products. It starts with the method of study site selection, fieldwork procedures, methods of estimating proportion and quantities, and the methods of using data collection to model and calculate village economy and the value of forest inputs. It describes the method of using data to evaluate household output values and closes with modelling the village economy by calculating the net village products.

Chapter four describes the research area of East Kalimantan in general and the District of Paser in particular. Chapter four also explains the geography and land use system of the province and district of Paser, its population, demography, social aspects, employment, economy and forestry sector. Research sites are also described in the context of their forest and forest functions, people, current use of natural resources and their access to the use of forest and forest products. The three village research areas and other comparative villages are also described at the end of this chapter.

Chapter five discusses the resource management and the use of non-timber forest products by the people of Paser in three research village areas and other comparative villages. It begins with the methods of collecting data and briefly describes the objectives of the chapter. This is followed by a description of the existing resource use among the community. This chapter also describes the land use system of each village in terms of both traditional land arrangements as well as the adoption of monoculture systems, such as rubber and palm oil plantations. Forest products and prominent use are also discussed, in particular for rattan products, wild honey harvesting and the production of other important non-timber forest products, such as wild animals, fruits, vegetables, medicinal plants, etc. Their contribution to subsistence income and providing cash is examined and the chapter concludes with the major results from an inventory, which describes the potential for development of the resources for sources of (alternative) income for the community.

Chapter six describes the results of the calculation of the economic value of non-timber forest products for each village at the research sites. It begins with the calculation of the economic value for the village of Rantau Layung, followed by the village of Pinang Jatus and the village of Muluy. It assesses the household labour inputs in each village, the contribution of capital stocks to the production system, and it estimates the households' outputs. Households' outputs were estimated by assessing farm outputs, hunting, fishing, rattan harvesting, wild honey collection, forest food and fruit collection, palm sugar, handicrafts, and fuel wood consumption. Chapter six concludes with the derivation of the forest use values and summarises the total economic value of NTFPs in the village research area.

Chapter seven analyses the comparison of the economic values of NTFPs in three different research villages. Comparisons are made for labour supply, sectoral outputs, household capitals and output distribution among the villages. These comparisons are designed to evaluate the level of village dependency on forest resources and their dependency on NTFP's values.

Chapter eight describes the non-economic value of NTFPs at the research sites. This includes the social and cultural values of forests and their products, such as social ties and kinship, cosmovision and property rights. A valuation is also made of the people's perceptions on current development issues such as government programmes on rural development, their responses to future development and their attitudes towards the changes in their rights to resources.

This thesis is concluded with a synthesis in chapter 9. This chapter begins with a discussion of non-timber forest products economic values and it compares the findings of other researchers. This is followed by the constraints of the research and the sources of possible data weaknesses, as well as a discussion on cultural and social capital, NTFP prioritisation, policy strategy and some possible interventions for better economic development of the research area. Chapter nine concludes with suggestions for further research, including the recommendation that further studies can overcome the comprehensive valuation of tropical forest functions in the Paser District of East Kalimantan.

1.5. End notes for chapter one

It is clear from the introduction above that sustainable development is a complex and difficult goal, but that it is a global goal that people throughout the world consider worth achieving. It is also clear that forestry has an important role to play in our survival. Forest management, therefore, can make a significant contribution to the global goal of sustainable development. Without improved forest management practices, global sustainable development is unlikely to be achieved, because of the impact of that forest ecosystems have on both climate change and biodiversity potential. When we look at the contribution of forests to various aspects of human well-being it seems irrational to destroy them. Nevertheless, in the last 40 years, such significant changes have taken place within the forests and their ecosystems that if these changes continue unchecked, then the existence of forests in the future will no longer be a certainty.

An important way to ensure the future maintenance and protection of tropical forest is to develop methods of forest management that allow income to be generated both today and in the future. It is important for policymakers around the world to shift the paradigm of tropical forest management from one based on the removal and export of natural resources, to one based on environmental stewardship. However, there is little evidence of such a paradigm shift taking place any time soon. It is suggested that in the future change may be brought about through the development and implementation of a number of management options and services provided by forests and, in particular in tropical regions, it should be possible to encourage stakeholders to take a longer-term view of their use of the resource, and to stimulate them to conserve it for the use of future generations. The means to achieve this and the examination of its complex functions and values could be one of the possible answers to tropical forest sustainability.

The global nature of deforestation is something that policymakers must come to terms with if sustainability is to be achieved. This problem must be addressed on an international level, rather than being left to the discretion of individual governments. Naturally, the priorities of policymakers in developing countries must concern the ability of their people to make best use of their own resources, and clearly they will view the problem differently from those concerned with the global environment. In view of these considerations, the achievement of sustainable development will therefore depend on two main foundations:

- An increased understanding of the economic and biophysical interrelationships that are characterised by the modern world
- The development of appropriate attitudes, policies and the institutional necessities to bring about the inevitable changes that are a pre-requisite to sustainability

An appropriate valuation of the economic value of non-timber forest products for rural households' economies will assign the monetary values of resources for a community. This is clearly an important issue in the achievement of sustainability, and it is hoped that this work will make some contribution to that debate. In addition, however, by emphasising the importance of non-monetary values, it is hoped that policymakers will accept the need to afford traditional lifestyles with more importance than has been the case in the past. As a result, it may be possible to establish a greater degree of security for forest dependent people's way of life, while at the same time bringing about a real improvement to the standard of living for these currently very under-represented groups. It is one aspect of the first of these two concerns that is addressed in this study, where the use of non-timber forest products and their economic value in household economies of the indigenous Paser people of East Kalimantan are examined.

Chapter 2

Theoretical Context Regarding the Economic Valuation of the Environment and Tropical Forest Ecosystems

2.1 Introduction

The concept of value has been addressed by many disciplines, but conventional economics estimates what something is worth based on our preferences, and using a unit of money as a measure of value. Preferences are determined by a number of factors and vary between different interest groups. This makes them both subjective and dynamic. Measurement of such 'fuzzy' variables is a difficult task.

The objective of this chapter is to investigate how the problem of valuation is addressed in environmental economics with special reference to non-timber forest products (NTFPs).

2.2 The theoretical foundation of tropical forest economic valuation

Conventional neoclassical analysis of a market situation involves an examination of the demand for and supply of a good or service. In the case of environmental goods and services, such a framework implies that prices are similarly determined by the supply and demand for those goods and services. Any monetary value applied to the environment should represent the value placed on it by society. Given the usual assumption of optimising the value of the natural resources that we have, the value will be at a minimum where the *marginal* costs of using it are equal to the *marginal* benefits derived from it. With increasing marginal benefits, net value will increase. In the case of environmental goods or services, the costs and benefits are usually referred to as *social cost* and *social benefit*. This contrasts with more conventional models, which commonly use *private* costs and benefits associated with neoclassical market models (Pearce & Turner 1990). The demand for environmental goods and services can be depicted graphically and is shown in figure 2.1.

2.2.1 Total Economic Value

For a better understanding of the economic valuation of NTFPs, some theoretical background is required. Figure 2.1 represents the demand curve for environmental goods, such as NTFPs (Barde & Pierce 1991). From figure 2.1 we can see that at a price (P1), quantity (Q2) is consumed. At such a price, the total costs represent the area C, while the *producer surplus*, area B, represents the *net rent* for the use of factor inputs, and area A represents *consumer surplus*. Looking at this model, we can conclude that the two areas, A an B, represent the total net benefit from the production and use of any goods or service. This is the basis of the Contingent Valuation Method (CVM) of environmental evaluation. The concept of *Willingness to Pay* is depicted here as the total area represented by A, B and C, or the area under the demand curve. It is important to remember that in addition to the *consumer surplus* and *net rent* depicted by A and B, this amount also includes area C, representing *costs.*

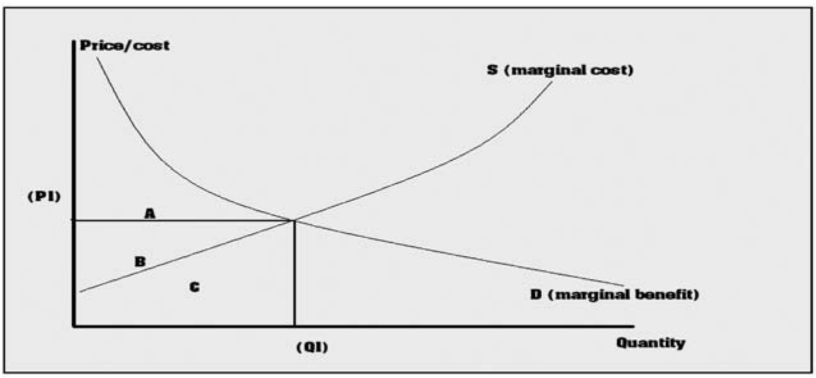


Figure 2. 1. Demand for environmental goods and services (Pearce et al. 1989)

Assuming that the demand curve exists, we can now say that the areas A plus B also represent the *Total Economic Value* (TEV) of the resource. TEV is usually described as being made up of *Option Value, Use Value*, and *Existence Value*, and the challenge lies in devising methods to calculate these in a meaningful way (Pearce et al. 1989). By designing methods to elicit measures of value based on *Willingness to Pay,* it becomes possible to ensure that all aspects of production costs (including social costs) will be covered by market prices. If this does not occur, then this is classified by neoclassical economists as *market failure.*

2.2.2 Use value

Use value can be defined as the value of those products or services useful to humans that can be produced from any (natural) resource. These can be calculated relatively easily, and monetary values can be placed upon them. *Shadow Pricing* is the general approach used to generate prices for environmental attributes, with the Travel Cost Method, Hedonic pricing and surveys of *Willingness to Pay* being specific applications of this approach (Pearce et al. 1989).

2.2.3 Option value

Some economists also include the *option value* in the valuation process. This value keeps open the option to use a resource in the future. This is essentially an expression of the consumers' preferences for the preservation of a natural resource in the case where a change arises in terms of its use (Kengen 2007).

2.2.4 Existence value

Existence value is the final and most complex part of Total Economic Value; certainly, it is the most difficult to measure. Sometimes referred to as the *Preservation value*, the existence value is based on intrinsic value, which implies that the environment has a value of its own, totally unrelated to the value placed upon it by human beings (Godoy et al.1993). Statistically, these intrinsic values can be described as *fuzzy values*, which do not fit in well with conventional methods of analysis implied by the *Marshalian Demand Curve*, such as the one described in figure 2.1. This is a major criticism levelled at many attempts to evaluate the environment. Trying to understand the world in terms of econometric models may be unrealistic, and failing to take these fuzzy variables into account may make conventional econometric analysis unreliable as an effective measure of environment value. This is the case in Indonesia, where many NTFP products are not used and their functions are not yet known. However, this does not mean that the resource is without value for the environment and future human generations (CIFOR 2007).

2.2.5 Pareto optimality

Pareto optimality refers to an important aspect of neoclassical analysis, concerning the way in which the benefits and the TEV are well distributed between economic agents. This is effectively a criterion of social desirability, which demonstrates how resource allocation is at an optimum when an agent's welfare cannot be increased without causing a reduction in the welfare of other agents. The fundamental theorem of welfare economics tells us that anequilibrium in the perfect market will be a *Pareto optimum* situation (Begg et al. 1994); hence, the stress in the economic analysis lies on the role of markets. It is important to remember, however, that *Pareto optimum* level production is only likely to exist in theory, since the idea is based on the hypothetic concept of *perfect* *competition*, which depends on strong assumptions such as *consumer rationality, perfect knowledge* and *zero transaction costs*. Thus, according to this theory, resource allocation can be classified as efficient when the *Pareto criterion* is satisfied.

2.2.6 Market failure and externalities

According to neoclassical theory, market failure is said to occur when an equilibrium between marginal costs and benefit does not exist – so a Pareto efficient outcome does not occur. In such a situation, the price is influenced by either demand or supply factors, or both, in such a way that the market mechanism does not function. The outcome of the situation in which this occurs in relation to the environment is where the *social* or *public* costs are not covered by the market price; this results in *externalities*.

Externalities refers to the *external* cost resulting from any economic activity. For example, costs that are incurred by society rather than by individual economic agents. These involve two criteria: *loss of welfare* and *lack of compensation* for this loss. Pollution is a classic example of an externality, since it results from the actions of individual agents, but it reduces the welfare of other agents in the society without compensating them for their loss. The policy problem is to identify the value of this *loss of welfare* and then to implement financial and institutional mechanisms in order to assimilate these costs into the accounting structure facet by the agent responsible for bringing about the loss. An example of how the costs of environmental damage may be *internalised* is demonstrated by the imposition of a *corporate social responsibility (CSR)* tax in West Kutai in East Kalimantan province, for the removal of gold and minerals beyond the community (Rio Tinto 1999). Through the imposition of this tax, revenues can be collected from companies and used to make reparations for any damage they may have caused in the course of mineral extraction. This is an example of the *polluter pays principle*, which removes the externality by enforcing a compensatory payment.

In relation to environmental issues, market failures arise when such externalities exist. Often, they are caused by policy failures (Cornes & Sandler 1996). These occur when governments fail to implement adequate legislation to ensure that compensation for environmental damage is somehow paid by those responsible for it. One of the causes of policy failure is associated with the question of property rights.

2.2.7 Property rights and stakeholders

Property rights related to the use of resources – and in particular the use of forest resources – have been discussed in many publications (Persoon et al 2004; CIFOR 2006; World Bank 1992; CBD 1993). In practice, the common use of the term refers to the actual ownership of land or other property; however, in relation to its use in economics, the term refers to the right to use a resource, whether it is owned or not. In some situations, property rights can be *private*, or may be a *communal* or free resource. In the case of the atmosphere, for example, this is seen as a *free resource*, since it is not owned or controlled by any agent; yet, all economic agents have a right to use it for their survival. Common property resources also include open access areas, such as deep oceans and areas of tropical forests. In the latter case, these resources may technically be owned by a government, or by individuals, but people dwelling in the forests have a de facto right to use these resources. Thus, they must also be considered as *stakeholders*. The term stakeholders refers to all economic agents who have some form of property right on the resource. Successful resource management requires that all stakeholders should be involved in the decision-making process related to its use. Only by including the views of all stakeholders can an accurate estimate of social costs be made, and the existence of externalities, if any, can be identified.

The situation of common property resources exists in many areas of tropical forest. This is especially the case in more inaccessible areas, such as the upper Mahakam of Central Borneo. According to neoclassical theory, society's total net benefit from land will be lower under a common property regime (Todaro 1994), and individual agents may be unwilling to invest capital or labour in any infrastructure improvement that has a common benefit. This is illustrated by the case of poor farmers being unwilling to limit rice cultivation in a forest farm area, in order to gain more rice in the future to meet the household needs. That said, in many parts of the world, indigenous resources management strategies have evolved. This is illustrated in a study by Colfer (1996) of forest resources in Borneo, or a case study about water management in the Philippines by Siy (1982). The development of a personal commitment and participation on the ground is crucial for the success of local management strategies. As Siy (1982) puts it, 'in order to discourage free-riding, it is necessary to develop incentives and sanctions which promote long term participation and involvement in group tasks.'

2.2.8 The nature of public goods

The environment and its various attributes have often been described as *public goods*. Public goods are those that have a variety of characteristics, in particular, they are said to be non-rival and non-excludable (Cornes & Sandler 1996). This means the consumption of that good by one person does not prevent its consumption by anyone else. Moreover, it is impossible to prevent anyone from consuming it. Public goods can exist in nature, and include elements such as clean air, pleasant scenery or warm sunshine. In the past, these elements have been considered by economists to be *free goods*. However, this has resulted in market failure, in the sense that their value is not accounted for in conventional private or public accounting frameworks. In many cases, when private action brings about a reduction in the availability or quality of such public goods, then an externality is said to exist, and institutional mechanisms are needed in order to address the loss of public amenity. This is the case, for example, with atmospheric pollution resulting from traffic or electricity generation.

Extensive research has been carried out on the nature of public goods and externalities, and much of this is summarised by Corners and Sandler (1996). These authors also demonstrate how conventional neoclassical economic theory tries to address this in order to establish how prices can be applied to public or semi-public goods. Due to the non-excludability mentioned above, the problem of pricing public and semi-public goods is very complex, and raises an issue that has come to be known as *free-riding*. This refers to situations where consumers may gain some benefit from a good or service, without payment for it being enforced. The problem of pricing public goods, and the accompanying problems of *externalities* and *free-riding*, constitute an important area of research in environmental economics, one that, to date, has failed to integrate the economic concern for allocation efficiency with the distributional concerns associated with equity or social justice. Once again, progress can be made in this area if more information can be collected about the resource use-values of various stakeholders. Furthermore, it is hoped that by identifying some of these use-values, this type of research will make an important contribution to solving the problem of *free-riding*.

2.2.9 The concept of shadow pricing

Shadow pricing is a means of attempting to put a figure on the value of social costs. This approach has been used for many years in welfare and development economics as a method of reflecting the true *social opportunity* cost of using resources. This can be explained as the value of all goods that will have to be given up by society in order to provide enough resources for the project to be undertaken. The *shadow prices* are assumed to represent marginal social costs, which generally indicate consumers' willingness to use resources and the value society places upon them. In practice, however, it is rather difficult to estimate marginal social costs accurately.

An interesting example of how shadow pricing can be applied to environmental evaluation is given in the work of Greenomics (2000), which attempts to assess the shadow price of Kayan Mentarang National Park in East Kalimantan. By analysing the flows of products generated by this land to the people in the district, they show how those benefit flows are able to influence the local government to pay more attention to the protection of forest land.

2.3 Time and the problem of discounting in valuation

The conceptual problem of the valuation of NTFPs is further complicated by the issue of sustainability and the links between economy and ecology. An increasing body of literature is available on this subject, (which we shall return to later in section 4), but much of the debate hinges on the concept of time, and how it should be used in evaluation procedures.

In order to bring about a more sustainable approach to development, the question of *time* is clearly important, both, from the point of view of the timescale of our analysis and from the point of view of *discounting*. The use of discounting is an attempt to bring about a *temporal distribution* of environmental effects, which is achieved by weighing current effects against future effects (Pearce & Turner 1990). Any discount rate above zero implies a preference for the present over the future. This is related to the fact that benefits that appear far into the future seem unimportant in the present. This clearly creates an ethical problem when trying to take account of ecological and ecosystem processes that influence the very life support system of the planet.

Another important consideration relating to interest/discount rates is the concept of *Capital Productivity*. This refers to the fact that capital invested in productive resources (capital formation) will generate a stream of future income in excess of its current value. As long as the future benefits of this investment are worth more than the current benefits, it is rational – in neoclassical terms – to proceed. Complicated further by the existence of uncertainty and risk, (which are assumed to increase with time), the value of benefit or cost is thought to decline as risk and uncertainty increase (Pearce & Turner 1990).

2.3.1 Cost Benefit Analysis: the foundation of monetary valuation methods

By using shadow prices, a calculation of the monetary value of both costs and benefits can be made. The application of *Cost Benefit Analysis (CBA)* attempts to measure the monetary value of the social advantages of a project, in comparison to its costs (Todaro 1994). Used as a rational decision-support tool, this technique assesses the viability of projects at the planning stage, based on neoclassical principles of economic efficiency. On the basis of this type of analysis, a project is not viewed as worthwhile in terms of CBA, unless the value of resource-benefits are greater than the value of the benefits when the resources are replaced or destroyed by the project. This *damage assessment* can be compared to the *benefit assessment*, which will produce a final figure to indicate the *net social benefit*. If this comparison yields a positive value, the project under consideration will be seen as favourable; whereas, if a negative value results, it is more likely to be shelved (George & Shorey 1980). The procedure for conducting a CBA follows the following basic structure:

- The problem needs to be clearly identified, with the reasons for the study clearly expressed.
- Social costs and social benefits must be identified, after literature reviews, preliminary investigations, and possibly a pilot study.
- Costs are measured by conventional methods.
- Benefits are measured by an assessment of individuals' *willingness to pay*.

- The flow of benefits minus costs over time is calculated, and then discounted to give the Net Present Value.
- Intangible or un-quantified effects are described qualitatively, and compared to the quantified values.

In a perfect hypothetical world this procedure may function effectively, resulting in a more sustainable allocation of resources; however, in the real world, errors in calculations such as these, and the uncertainties associated with ecological interactions, combine to render it less useful. Furthermore, the distributional problems of both costs and benefits are not dealt with in this type of analysis (Fauzi 2004). Consequently, conflict may arise between different interest groups. The level of conflict may be affected by the various outcomes. In addition, no consideration is given to how these costs and benefits may be spread over time, and so some positive solutions could be unsustainable in the long term. Methodological problems such as these have been illustrated by number of recent road development projects in Indonesia. The development of road construction crossing a national park is expected to attract illegal immigrants, who will encroach on the land. Thus, although benefits should be going to the people in the area affected, in reality the benefits of this development will go to the illegal immigrants. The forest is subsequently degraded by land encroachment. That these projects were approved in the first place reflects the fact that, for some of those affected, insufficient value was placed on the more esoteric aspects of environment value. This counts especially for the existence –and optional values – of woodland areas damaged during the road construction process.

Another problem arising from the use of conventional neoclassical analysis is that it depends on the calculation of the *Net Present Value (NPV).* To calculate this, we first have to maximise the sum of benefits minus costs. Mathematically, this can be presented using the following formula (Barde & Pearce 1991):

$$NPV = \sum_{t-1}^{T} \frac{B_t - C_t}{(1+r)^{t-1}}$$

where B_t and C_t are the benefits and costs in time period t, using a discount rate of r, and for a time horizon T.

If all costs and benefits are measured using the same units (valuta), then this calculation is straight forward; if they are not, the calculation is not possible, and the analysis is reduced to being a *cost effectiveness analysis*. This is an analysis where benefits analysis is identified and the *social welfare function* is maximised. It is important that any value assigned to either costs or benefits accurately reflects society's valuations. One of the major problems with this is determining the means of assessing values when markets do no exist. This is especially true in the case of public goods, or in situations that reflect some form of market failure. Furthermore, although costs may sometimes be relative simple to identify, benefits are more difficult to identify and measure. A benefit to one person is not always a benefit to another, and the degree of benefit gained will vary from person to person, particularly in the case of public goods, or in the use of open access resources. The calculation of the benefit cost of NTFP extraction for this study will follow the method explained above. It is conducted to compare the economic value of NTFPs with the economic value of other agriculture products such as palm oil.

2.3.2 The use of environmental values

Calculating the value of any resource will give an estimate of what it is worth in terms of its *non-development option*. If we are able to calculate this accurately, we can use it as a yardstick to evaluate any development proposal, in order to ensure that only those developments that generate income greater than the *Total Economic Value* (TEV) would be acceptable to policymakers. More explicitly, to evaluate the feasibility of any development project, we can use the following formula (Barde & Pearce 1991):

$$\boxed{(Bd - Cd - TEV - Cc) > 0}$$

where:

Bd – Benefit derived from the development
Cd – Costs of making the development
TEV – Total Economic Value
Cc – Costs of Conservation

It is clear from this equation that an efficient system of environmental valuation is an essential part of the effective management of natural resources, and it contributes to the project evaluation design.

As outlined in Section 3.1, in order to take account of the future, the values in the equation [3.1] are discounted, as most people tend to value the future less than the present (Pearce & Turner 1990). This can be referred to as *social time preference*. Another serious criticism levelled at environmental evaluation techniques concerns the choice of discount rates. At this point, it is worth noting that different discount rates can produce different results: a project may seem positive at one discount rate but may seem negative at another. According to conventional views of investment appraisal (Lumby1991), as long as the value obtained from equation [3.1] is positive, the development project is expected to generate positive net- benefits. Disregarding any distributional inequality, in terms of *social benefits*, this may lead to an increase in human well-being or other measures of the standard of living. From this, it is clear that policy failures will inevitably result from a lack of concern about social time preference rates, and in the case of tropical forest ecosystems, such mistakes could have irreversible consequences.

To prevent possible errors, the government of East Kalimantan needs to take more care with decisions related to environmental attributes. If the traditional neoclassical profit-maximising approach is taken as a principle, focused on private costs and benefits, we may find that initially a project is seen as profitable and worthwhile (having a positive net present value). However, at a second glance, if we take a more *holistic long term approach* by including environmental variables in our appraisal, we may find that the same project would have a negative net present value, and should therefore not be undertaken.

Although environmental evaluation is a complex task, adding such methods to conventional investment appraisal techniques could prevent marginal economic activities from being undertaken at the expense of irreplaceable natural resources. In the past, this has occurred in such places as East Kalimantan (CIFOR 2007) where the palm oil plantations have been established in areas of cleared forest. At the time, it was seen as a viable development strategy for the region of East Kalimantan, one that offered tax breaks and subsidies for new exogenous species of timber plantations. The result of this development is that the production of timber from plantations has increased, but with a productivity rate so slow as to make it virtually uneconomic (BPS 2008). To make matters worse, the plantations of oil palm and timber estates have caused serious soil erosion and now the area can be used for little else (CIFOR 2006). Hopefully, improved methods of environmental evaluation will contribute to the prevention of such mistakes in the future.

A publication by Costanza *et al.,*(1997), on the question of valuation, has raised considerable debate. This paper attempts to estimate 'The Value of the World's Ecosystem Services and Natural Capital', clearly an extremely complex and controversial task. On the basis of an extensive literature review, the authors were able to produce a figure for the value of the 'entire biosphere', based on 17 different ecosystem services, from 16 different biomes. Most of the values included in this estimate are based on non-market services, such as the regulation of the chemical composition of the atmosphere, or the maintenance of soil quality, and a wide range of valuation methods have been used in the various studies included in the estimate. The final computed value of the flow of services from the biosphere ranged from US$ 16-54 trillion (10^{12}) per year, significantly more than the total global value Gross National Product of US$ 18 trillion per year. This finding again shows the important value of the environment. It confirms that incorporating the values of forest ecosystem products such as the use of NTFPs gives a more complete understanding of the total environmental value.

While the authors themselves have pointed out the 'crude and imperfect methods used' (Constanza 1997), and a number of other writers have highlighted other methodological weaknesses (Ayres 1998; Hueting 1998; Daly 1998), it is still an important contribution to a research area that is very much in its infancy. To understand the difficulties associated with such a task, it is necessary to examine the various valuation methodologies used, and the weaknesses to which they may be subject.

2.3.3 Current techniques of the forest ecosystem valuation

Three basic approaches to forest ecosystem valuation are used frequently today. They all attempt to assign monetary values to forest attributes, and can be identified as:

1. *Market based methods* (from both direct and indirect market statistics, such as the travel cost method, and hedonic pricing);
2. *Revealed preference methods* (where, in the absence of actual markets, preferences of consumers are assessed through surveys, e.g. Contingent Valuation);
3. *Statistical analysis* (such as identifying response linkages, e.g. investigation of the mortality and morbidity impacts of pollutants) (CIFOR 2003).

Based on the motivation behind them, all attempts at forest ecosystem valuation can be classified into the following categories:

- Those that try to estimate values for existing forest ecosystem assets. A well-known example of this is the work done by Bann (2007), the valuation of non-timber values of tropical forest ecosystem.
- Those that try to estimate the degree of damage projects are *likely* to cause, exemplified by the World Bank (1994) study of pollution and congestion impacts in Thailand.
- Those that try to estimate how much environmental damage the project or production technique has actually caused. An example is the Exxon Valdez tanker spill of 1989. In this case, an oil slick was released covering an estimated 1000 sq. miles of the Prince William Sound (Goldsmit & Hildyard 1990).
- Those that try to estimate the benefits of projects, such as the improvement of water quality; e.g. Bockstael (1987).
- Those that try to estimate how economic variables such as employment, income, etc., will be influenced by alternative resource uses. An example of this is provided by the study of the effect of flooding in the Falce Valley in the Po Delta, Italy (Munda & Nijkamp 1995)
- Those that try to measure ecosystem health, such as the work by Costanza and Perrings (1990), which implies the need for weightings to be used to take account of the relative importance of the many different facets of what makes up the environment.

The choice of valuationmethod selected will depend on a number of factors. Clearly, if one wants to develop fiscal policies to counteract environmental damage, one needs to look to various types of information and relationships between the damaging activity and the social costs incurred by them. On the other hand, if the objective is to assess the various income potentials for alternative land uses, we need to look at how the environment is likely to be influenced by the different option. Thus,we can identifywhich option has the maximum net social benefit. Another factor that will influence the choice of the evaluation method used, is the cost of study. A long and comprehensive survey is costly to run, but a reduction in comprehensiveness may reduce its validity and reliability. Due to the nature of NTFPs, a combination of market based techniques and the preference methods were used for my study. A reason for this is that certain (parts of) NTFPsare not traded at all andare used for subsistence needs only. However, other (parts of) NTFPsare produced for markets. Therefore, the use of contingent valuation method is appropriate.

2.3.4 Direct methods of valuation

Direct methods of valuation are market based. These methods are designed to measure the monetary value of forest gains (or losses) resulting from forest NTFP production. The use of these methods is directly related to some forest ecosystem features (such as clean water). When using these methods, we try to identify individual values expressed either in terms of willingness to pay (for a benefit), or in terms of willingness to accept (compensation for a loss of environmental benefit).

The basis of this direct approach to valuation is the principle that individual preferences count, and that individuals are the best judge of their own welfare. As a result, the analysis is based on data collected directly from conventional, implicit or artificial markets (Pearce & Turner 1990), and shadow prices are used to calculate forest ecosystem values. From the willingness to pay values derived by these market surveys, a demand curve for the attribute can be constructed, and the level of consumer surplus can be measured. According to the neoclassical approach, this consumer surplusindicates the level of social welfare associated with the consumption of the forest products. One of the earliest attempts to assign monetary values to the forest ecosystem was developed to enable more effective management of National Parks in the US(Hotelling1949). This became a popular method of environmental valuation, now known as the travel cost method.

The method of direct valuation is used, for example, to measure the economic value of the production of wild honey. By knowing the value of honey production to the household economy, the willingness of villagers to maintain this resource will also be known. So, theoretically, their willingness to maintain this resource can be used as an indicator of the value of the forest ecosystem services to this community.

2.3.4.1 The Travel Cost Method

The Travel Cost Method (TCM) of valuation evolved from the work done by Hotelling (1949), on US National Parks, and is based on the idea that the value placed by society on specific environmental attributes, is indicated by how much people actually pay to travel to a particular location. This is an extension of Recreational Demand Model, which specifically looks at values placed on time and the choice of site visits. Extensive examples exist for studies of this type done in the US, where the method has been used frequently to evaluate the benefits of improvements in recreational facilities. It has also been used in other developed countries and, to a lesser extent, in developing countries such as Malaysia, Indonesia and Thailand. In studies by Bockstaelet al.(1987), the method has been used to look at improvements in water quality.

One of the main problems of this method is the estimate of time. One of the most important variables used by TCM is the time spent in travelling to the site, as well as the cost of transportation and entrance fees. Most studies use figures for the price of time as approximately one third of the average hourly wage. The results of these studies reveal a high degree of sensitivity between the time-value variable and the final results. Atransaction bias may also occur, resulting from the fact that the data do not include information from households that do not use the site (Smith & Kaoru 1990). Distortions may have the effect of causing estimations of benefits to be unreliable.

The basis of the TCM is that any increase in environmental quality will lead to increases in the level of consumer surplus, which will indicate how welfare has increased. The changes in consumer surplus arise due to the shifts in the demand curve, caused by changes in demand for the environmental attribute, as a result of its improvement. By summing up over all households, the total value of that improvement can be calculated. For this method, large amounts of data are needed, and both continuous and discrete data models are used.

There is no doubt that this method has been widely used and frequently refined to the point that it has produced many results, which have had a positive input on environmental management strategies, particulary in relation to recreation sites, as well as for the provision of basic infrastructure such as water services. The large amount of data required by the method, and the problem of time-value estimation, make the use of this method in developing countries rather dificult. However, when applied to specific recreational benefits related to tourism, it can be of significant use.

2.3.4.2 Hedonic pricing

Another method using implicit markets is known as the *Hedonic Price Method*. This type of assessment uses differences in household or land prices to indicate differences in environmental qualities, and therefore different environmental values. Environmental valuation by hedonic pricing is based on direct information from the market. It is also based on links between the consumption of certain goods and services and the consumption of newly marketed goods and services (including environmental attributes). The underlying assumption of the approach is that the prices of land will reflect the quality of their environmental attributes. It is a type of study that tries to identify the relationship between the environmental attributes and the price in relation to the market. It is usually based on cross-sectional data, to avoid having to control other variables over time. Multiple regression techniques are used to identify the degree to which property differentials are due to environmental variables in order to estimate how many individuals would be willing to pay for an improvement of that environmental attribute, and what the social value would be.

Early attempts to use this method (Thibodeau & Ostro 1981), used commercial and recreational activities as the basis for wetland valuation. In developing countries, Jimenez (1983) investigated improvements in sanitation services in Manila, while Markandya (1991) attempted to estimate the benefits of the new sewage system in the capital of El Salvador. However, because of the data requirements, this methodology is most suited for developed economies, where comprehensive data on property markets are available. An example of this is given by Cropper and Oates (1992), where various environmental factors influencing property prices were identified. Although this method can be of value in certain circumstances, it does seem that the result may be unreliable if the quality of data is poor, and if the estimated model fails to represent all explanatory variables (Markandya 1991).

The method of hedonic pricing has not been used for the valuation of the economic value of NTFPs and, therefore, this method was not used in this study. In general, the hedonic method is mostly applicable tourban situations.

2.3.4.3 Contingent valuation methods

The method is based on artificial markets and preferences, which do not actually exist, but which are described hypothetically by respondents in a survey. An example of this is a survey asking farmers how much they would value greater wildlife for hunting animals around their village. Another example is asking these farmers how much they would value a clean water supply (assuming that one does not currently exist). This type of hypothetical valuation is known as the *Contingent Valuation Method*, and it has become increasingly accepted in recent years. According to a survey of a large number of CVM studies, there area number of constraints when using this method (Mitchell & Carson 1989). However, the response of individuals to hypothetical questions is a consistent indicator of their actual behaviour.Popular in the valuation of NTFPs, this method is now gaining ground in tropical countries. One of the best known of these studies is that by Wollenberg et al. (2002), who investigated the income of forest dwellers from NTFPs in Kalimantan, and also Caldecott (1988), who estimated the total value of hunting in Sarawak. Several other valuation studies have been undertaken using this approach, including those of Angelson and Wunder (2003), and Kengen (2007). The increased interest in this method in recent years is possibly due to the fact that it may be the only suitable method available in some specific situations. In addition, it is a method that can be applied in many different situations that requireforest product values, such as in this study.

2.3.5 Indirect methods of valuation

Statistical methods for valuation rely on the existence of a relationship between environmental attribute (e.g. pollution) and a change in an observable human behaviour or condition, such as health. Once this dose-response relationship is established, it is then assessed in terms of the economic value of its effect. An example of this would be the man-hours lost as a result of illness caused by working conditions, such as in a coal mine or asbestos plant. In these cases, benefits were observed to be greater than the cost of the filters and, thus, the management could be easily convinced of the usefulness of using filters.

This method of valuation is especially useful in situations where adequate price and expenditure data are not available. It is effective in situations where there are clear relationships between pollution and material damage, such as those that occur in buildings, between soil erosion and declining agricultural yields, and between pollution and aquatic ecosystems (Markandya 1992). For greatest reliability, these dose-response linkages need to be analysed with a behavioural model of the demand for the goods and services that are affected, although this has only been done in a few cases, such as in a study examining the impact of forest fires in East Kalimantan (GTZ 1999).

In developing countries, where market methods based on revealed preferences are not feasible, and where people may be unaware of the effects of an environmental change, this method is preferred above more direct methods of valuation. Once the dose-response relationship is established, a monetary damage function is constructed (physical damage multiplied by the value per unit of damage) and analysed using multiple regression techniques. Similarly, benefits are calculated on the basis of damage avoided. Seminal work in this field has been done by Lave and Seskin (1977) and, since then, a great deal of research has investigated various aspects of it. Watson and Jaksch (1982) examined household cleaning and maintenance costs resulting from air pollution, and found that, as pollution levels fell, expenditure on these items fell as well, indicating a positive gain in welfare by the amount saved. This type of result is widely used to justify a clean air policy (OECD 1989).

One widely accepted estimate of material damage in the US is provided in the study by Horst et al. (1986), which found a significant relationship between pollution in four major cities and the level of material damage measured there, the value for which was then calculated. It provides a good example of macro-epidemiology, relating pollution to mortality. Later work in this area extended the relationship between environmental change and morbidity, although this is much less clear-cut. Application of the indirect method in the agricultural sector is also important. The effect of air pollution on crops is well documented and a complex analysis allows us to look at what the case would be at different levels of pollution.

2.3.6 Combining direct and indirect methods: Multi-criteria valuation methods

Multi-Criteria Analysis (MCA) is a decision tool designed to cope with both qualitative and quantitative data. Compared with standard neoclassical techniques, this method allows the analyst to take account of a wider variety of factors before taking a decision (Munda & Nijkamp1995). There are two approaches to MCA: the first is known as 'goal programming' and is based on a standard linear programming framework; the second is the analytical hierarchy process (AHP), which uses a series of paired-comparisons for preference ratings. The relative importance of various criteria is accounted for in this type of analysis through the use of criteria weights, and this way the preferences are identified. The AHP is used to develop decision priorities using a mathematical process known as *synthesisation.* This more sophisticated method developed by Saaty (1980), has the advantage of allowing the application of both positive and normative approaches to the problem solving situation, moving away from the rigid marginal analysis favoured by neoclassical theorists. The inclusion of the normative aspect makes the analysis more comprehensive, but critics of the methodology point out that it brings a measure of subjectivity to the final result. The difficulty can be overcome to some extent, however, if both the analyst and the decision-makers are aware of the specific, analytical meanings for the criteria weights used in the underlying model.

In MCA, problems can be divided into two basic types (Belton 1990): (1)valuation problems characterized by the need to choose between direct defined alternatives; (2) design problems, which can be described as those where it is necessary to identify a preferred alternative, and from which there may be an infinite set of possibilities, limited only by situational constraints.

The objective of either of these approaches is the same, i.e. to make a decision on value. However, the method of reaching the solution is not the same, and the solution itself may also differ. The brief analysis of this complex technique presented here, serves to illustrate the need for more research to be done on valuation methodologies in general. It is clear that a more comprehensive approach is needed when designing valuation strategies, and this provides support for the assertion that an interdisciplinary approach is the best way to address this issue.

2.4 A critique of NTFP valuation methodologies

Welfare depends on a variety of variables, including such things as income, access to basic infrastructure, availability of public facilities, and environmental quality. As a result, attempts to access welfare benefits will inevitably be met with difficulty. While some of these welfare-influencing variables may be easily measured in the conventional econometric sense, some of them, especially those relating to environmental quality, are not. These factors may possibly be measured both quantitatively and qualitatively, and the ability to integrate the two types of data into the problem-solving process will possibly result in more efficient techniques of forest ecosystem valuation. Some of the major difficulties of the conventional valuation methods are discussed below.

2.4.1General problems with valuation methods

Many problems exist with the various methods of forest function valuation. These include methodological problems, such as sampling procedures, survey models, and avoidance of various forms of bias, such as cultural or socio-economic factors influencing the results. In addition to these design problems, we are also faced with serious conceptual problems in product valuation. Under a neoclassical framework, we tackle the problem from the point of view of market failure, and we try to estimate the costs and benefits of forest change on the basis of preferences and utility. The conversion of utility to monetary values is plagued with difficulty, a point made early on in the debate by Krutilla (1967).

The use of consumer choices as a means of identifying product values is the traditional approach, but the concept of existence values makes this inappropriate. This point has been highlighted (Smith 1990), and it has been suggested that when measuring existence values, conventional valuation methods contribute little to our understanding of the trade-offs people would be willing to make, where non-use values are important. Smith (1990) also suggests that the degree of trade-off will depend upon how much is known about forest resources, which implies that as our knowledge of the environment increases, our valuation of it is likely to rise as well. A further problem with indirect methods in particular is the fact that individuals adapt to changes in the environment, so the *ceteris paribus* assumption used in neoclassic economic analysis cannot hold. It means that the assumption of input-output ratio remaining constant over time is incorrect, most likely resulting in an underestimation of the benefits of those changes using such a method.

2.4.1.1 Determining the definition of forest

Forest function may need to be defined when we want to explain what we mean by forest and environment. From an anthropocentric viewpoint, the environment is considered a life-support ecosystem. By identifying the forest as an ecosystem in itself, it must be acknowledged that it is at least partially organic, and a brief observation of any organic life-form shows that a reduction of the whole into its parts changes the basic nature of that organism. In a laboratory situation, neatly dissecting a frog into its parts, and then putting them together again in a bowl, does not replicate the original frog. This demonstrates a major weakness with the more reductionist neoclassical approach.

In literature, the terms ‘forests’ and ‘forestry’ are not used consistently. In what follows, we will refer to ‘forests’ in a way that is comparable to the definition of the Food and Agriculture Organization of the United Nations (FAO), i.e. forests with at least 10 per cent crown cover, including both open woodlands and plantations. In some cases, we refer to agro-forestry and trees on farms but, in principle, we count these activities as part of forestry, not agriculture, because both can produce similar outputs as forests.

By determining that forests are something that affect us all, we need to try to assign some form of global value to them, as well as simply taking the sum of their parts. There have been attempts to quantify this by a number of authors (Costanza 1997, 1998; Barde & Pearce 1991; Wollenberg 2003; Angelsen & Wunder 2003). Although such attempts have been controversial, it is generally agreed that, if the use option and existence values can be adequately captured, then the acceptable value of forest resources can be computed.

2.4.1.2 The problem of money

A problem faced by many studies is the choice of money as the numeric value in statistical analysis. This has been examined by Brekke (1994), who points out that using money as a numeric value will have the effect of putting a greater weight on judgments if compared to those who do not use money as numeric. This has a distributional implication, as higher income groups tend to value money less than lower income groups. As a consequence, the inputs into valuation figures by lower income groups will have more effect.

It is common for the use of money and its time preferences to be a major problem in the valuation of NTFP economic value. This problem is related to the units of money used in the calculation – whether the local currency is used or converted into a well-known currency such as the US dollar. If money is our operational unit, then any additional US dollar corresponds to the same amount of cardinal utility as any other US dollar, irrespective of income or other characteristics of the person receiving that dollar. It is obviously not realistic, as the value of a US dollar in terms of purchasing power, or utility, varies greatly from place to place and from person to person. The consequence of this is that if other values are used as a numeric unit in an evaluation problem, different results may be produced. For example, if the selected numeric unit is kilograms of NTFP production, instead of money, a completely different conclusion from the study could result. In practice, this means that the choice of numeric units favours different interest groups in society, but it may be possible to use a system of welfare weighting in calculations in order to overcome this. It is worth noting at this point, however, that by estimating the monetary value of environment resources, it becomes possible for policymakers to assimilate this information into their existing accounting procedures, thus possibly promoting more sustainable management strategies.

2.4.1.3 The problem of compensation

A further problem for economic valuation results from the Hiks-Kaldor criterion for project valuation, which suggests that a project is 'acceptable' if the winner can potentially compensate the loser (Fauzi 2004). This means that the compensation need not actually be paid to the losers, and so the project may end up being sub-optimal in *pareto* terms, in spite of an original positive valuation. An examination of the feasibility of transfers has recently been done in East Kalimantan (Greenomics 2004). This study suggests that compensation in the form of benefit transfers is not often possible. If the Hicks-Kaldor criteria are not met, then the project will not generate a true increase in social welfare in *pareto* terms, as the benefits accruing to some groups are not being achieved without reducing the benefits of others. In this case, 'others' can include future generations. This is another serious problem arising from the methods of analysis, which try to fit the valuation of forest function to the neoclassical framework. The problem of compensation has been crucial in East Kalimantan, in particular the loss of local people's access to NTFPs, as an impact of the logging operations (PEMA 2005). Calculating the value of NTFPs to the household economy supports the communities' bargaining power in fighting for NTFP resource damage compensation.

2.4.1.4 The effect of elasticity on forest ecosystem value

Although the conventional analysis of Total Economic Value (TEV) may seem straightforward, it is complicated by the fact that adequate information does not exist about both the supply and demand for many goods and services provided by forests (Begg et al. 1994). The slopes of these demand and supply curves represent the marginal propensities to consume or produce and, as a result of this lack of information, the shape of the curves themselves are often unknown, meaning that the size of the TEV will be difficult to determine. The slopes of these demand and supply curves are influenced by their elasticity (Begg et al. 1994), which itself is influenced by such factors as ease of substitution and degree of necessity. Given the finite nature of any ecosystem's *carrying capacity*, it seems likely that the supply of the goods and services it provides will ultimately be inelastic. At the same time, the demand for life support services provided by forests will also be inelastic; increasingly so, as populations rise, and carrying capacity is reached. The effect of these possible differences in elasticity is shown in figure 2.2 below. This demonstrates how the area represented by the consumer and producer surpluses (*A* and *B*), which make up Total Economic Value, are larger when demand and supply are inelastic (*A2* and *B2*). To overcome this difficulty, much more data are required in order to shed light on market conditions for goods and services provided by forests.

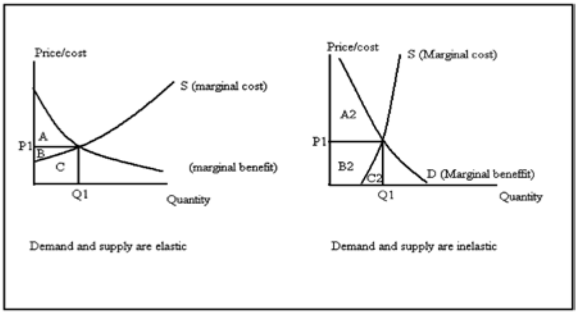


Figure 2. 2. Total Economic Value when elasticities of demand and supply are different (adapted from Constanza et al. 1997)

2.4.1.5 Problems associated with hedonic pricing

The Hedonic pricing method is subject to a number of difficulties, because this method can really only be applied in situations where the prices in the market are known, and when consumers are flexible enough to be able to indicate choices through their actions in that market. This is not always the case in developing countries, so this method has had limited application in the past. Although some attempts have been made to reduce the bias results when using the Hedonic Pricing Method, it still has some questionable features (Markandya 1992).

2.4.1.6 Problems associated with the Contingent Valuation Methodology

A major problem with the use of the Contingent Valuation Method is the difference in the values arrived at using either the *Willingness to Pay (WTP)* (for a benefit), or *Willingness to Accept (WTA)* (compensation for a loss). The purpose of conducting Contingent Valuation Surveys is to elicit responses from which we can construct a *hypothetical* demand curve. Since *the utility* (and preference) can vary along the length of the demand curve, we have to take account of this in our estimates of how changes in preferences will affect the environment.

The asymmetry of WTP and WTA measures is, to some extent, explained by the argument that benefits represent a *purchase structure*, while losses are more akin to a *compensation structure*. Psychologists have tried to explain the differences between WTA and WTP as an indication of *Cognitive Dissonance* (Pearce & Turner 1990), a concept well-known in psychological evaluation procedures. This supports the idea that some of the problems arising in valuation analyses may be avoided if interdisciplinary expertise is used at the design stage of the study.

One of the first studies to reveal the differences between WTP and WTA was that by Bishop and Heberlein (1979). Recent work has been based on this, such as that of Kengen (2007). It is argued that the differences between the two values can be reduced by the removal of *uncertainties*. Again, this implies that a more careful survey design could remove these difficulties, or possibly a factor could be calculated statistically to correct the difference between the two values. Obviously great potential exists for future research into this issue. As Smith and Karou (1990) point out, the problems associated with environmental and resource valuation are more likely to be solved if efforts are made to use *all forms* of behavioural information.

Since the object of such studies is to obtain a realistic value from hypothetical questions, it is very important that the survey or questions are designed in a way that reality is replicated as much as possible. The study needs to be conducted carefully to avoid errors, so that the *bids* (valuations) reflect the value of the hypothetical commodity or service as accurately as possible. An example of a project that has been treated in this way is the study on the Greenomics (2000) in Kayan Mentarang National Park, which produced a figure of US$21 million for the value of benefits to the local community, even though the area was previously described as a low-rent district (where values might be expected to be lower).

The expectation that values would be lower in low-rent districts, highlights one of the major criticisms of this method: It tends to be weighted in favour of higher income groups, as their WTP and WTA values are likely to be higher. Other criticisms provide the basis for a vast amount of literature on the CVM that questions the accuracy of the method. Problems such as *embedding* (when a respondent has a different understanding of a concept from how the products are used (Kahneman & Knetsch 1992), *starting point bias,* and *vehicle bias* may occur. These are ways in which the result can be influenced, and the value of bids can be distorted, by both the level of possible values summed in the survey questions, and the proposed means of payment used to finance the people (Wollenberg et al. 2003). For example, some respondents may react negatively to the suggestion of increasing levels, and this will influence their WTP values. Other design problems result from the fact that in some countries the languages used do not have a conditional tense and, as a result, translation of CVM questions poses a difficulty.

A study by Peterson et al. (1995) found that respondents gave different WTA values, depending on their level of *moral responsibility*. This is an example of an experimental approach to direct valuation. Using the *Paired Comparison Method* (a recognised psychometric approach), the researchers were able to assess the effect of sole or shared responsibility on the role of WTA environmental losses. This fits in with research into land tenure and on deforestation, which also shows that people place higher values on natural resource when it is under their control.

2.4.1.7 Problems with direct dose-response methods

There is no doubt that direct methods of valuation can have important policy impact and the potential for their use is great, but unfortunately this type of study often meets much criticism, resulting from the use of the concept of *value of life*. The type of WTP is not a monetary value that represents the value of an individual's life, but represents a reduction in the risk, as a result of a new environmental condition. If measures bring about a reduction in the risk of dying by a disease, the monetary value of this represents a summary of the WTP and a change in probability, not the figure required to prevent dying. Much literature addresses aspects of mortality and morbidity valuations, sometimes referred to as *riskanalysis*, and the method is still being refined (Opschoor 1998).

In a controversial paper, Pearce (1995) used this type of analysis to evaluate problems of traffic pollution in Bangkok. He concluded that environmental benefits would accrue. Highlighting the vast potential benefits from *conserved natural assets*, he suggested that the most effective way of capturing them is not only to improve the *means of valuing these assets*, but also to *design new institutions* to deal with them (Pearce 1998). This suggests a move towards a more *ecological approach* of economic valuation, and away from the conventional neoclassical view.

2.4.1.8 The need for non-monetary valuation

The sustainability of the use of tropical forests is one of the most complex problems facing policymakers in today's world. When the concept of sustainable development is applied, the problem of understanding how the best use of our resources can be made is even more difficult. The tropical forest ecosystem and its resources are all subject to a large degree of uncertainty and, being highly interrelated, their various functions and relationships are poorly understood. Attempts to find the ecosystem values of tropical forests, based only on monetary methods, do not allow for ill-defined values and qualities *as yet unknown*, to be included.

The understanding of the links between the economic and ecological worlds is still relatively imperfect, although increasing knowledge and technological changes have brought more clarity. Increasing public awareness, both nationally and internationally, is bringing pressure on policymakers to make the right choice both economically and, increasingly, ecologically. The experience of gold mining in East Kalimantan, which polluted the Mahakam River with its high chemical contents of waste water, is a good example. The Mining sector was forced to pay compensation and a huge payment for the loss of clean water for the community. This has highlighted the extent of the public *ecological* awareness, and the *economic* power that it wields.

The non-monetary valuation of NTFPs will help policymakers and foresters to understand more of the role of forests in the livelihood of local people such as the Paser community. It will also provide a better understanding of the forest and its ecosystem value, rather than just measuring its resources as a single product – timber. This can prevent unnecessary damage, by providing sufficient information to the government and to foresters, as well as to the local community, about the importance of maintaining sustainable uses of forests for rural development.

2.4.1.9 Combining different approaches to valuation

In a paper on the past and future of project appraisals, Wilmshurst (1995), senior economist at the British Overseas Development Agency, presented an overview of the methods of environmental evaluation. In his conclusion, he raised some issues for the future, stressing the necessity of the definition of objectives in evaluation procedures, as well as the probable need for institutional change. Both of these points reflect the situation today, which has given rise to four different approaches to environmental evaluation:

- the *Efficiency school* advocates pseudo-market valuation, while
- the *Equity school* sees the priorities of income distribution as more important, recommending *Welfare Weighting*.
- the *Ecological School* sees the necessity of respecting ecosystem integrity, and
- the *Philosophical School* proposes the ideas that consumer sovereignty should be limited in line with ethical and psychological considerations.

Each of these approaches has its merits, and there is no doubt that they need not be mutually exclusive. An approach to valuation that could combine these various ideas would certainly go some way towards arriving at a consensus about what we mean by environmental valuation. A more interdisciplinary approach to the difficulties coupled with a method of analysis that considers both *hard* and *stochastic* data, will possibly overcome some of methodological problems mentioned above.

2.5 End notes

Conventional methods of economic analysis are based on neoclassical roots, with concepts like *preference*, *indifference* and *maximisation of utility*. These methods were developed by mathematical necessity, based on rigid and often unrealistic assumptions. They provide economic solutions to policy problems, but they may have unfortunate consequences. In many developing countries, where policymakers have used rigid neoclassic development models, these decisions often bear little relation to reality (Jepma 1995; Deacon 1995). Such failed development policy can be seen in a number of South East Asian countries, such as Indonesia, where governments have used subsidies to stimulate activity and employment in one sector of the economy (such as industry), which subsequently may have had very negative economic effects in another sector (such as food production, resulting in food shortages or starvation in the long run).

Other governments in Latin America and Asia have considered their forests to be a national resource (Fearnside 1998), and they have tried to maximise the profits from them by selling valuable timber, without taking into account the long-term and irreparable damage to the economy, or to the environment as a whole. This has brought about serious problems of soil erosion, flooding and general land degradation. These problems have contributed to the increased poverty typical of some developing countries (Pearce et al. 1990).

The study by Costanza et al. (1997) has tried to evaluate the ecosystem values of forest. Opschoor (1998) has pointed out the need 'for additional research [...] especially in the area of methodology.' In relation to complex ecosystems such as tropical forests, any improvement in valuation methodology will require the collection of a wide range of information. It will also enable decision-makers to be better informed, and it is with this in mind that this study of NTFP-use by indigenous forest dwellers has been designed. By identifying current use-values of the products and services of tropical forests, it is likely that more accurate and reliable estimates of the Total Economic Value of the forest resource will be developed. By focusing on indigenous forest dwellers, the interests of an important group of stakeholders will be highlighted, thus enabling decisions to be made that are more in line with the spirit of achieving the goals of a comprehensive understanding of the forest ecosystem values.

From the analysis of the methods used in the valuation of environmental and forest ecosystem functions it can be concluded that there is no consensus regarding which method is better for valuations. It depends on the objective, the area of study, and also the time and budget researchers have. This study is an attempt to contribute to the debate about current development methods, by selecting two of the methods explained above as tools for NTFP product monetary valuation and analysis. Market Base Technique and the Contingent Valuation methods will be used for this study. The use of these methods will be elaborated in the subsequent chapters.

Chapter 3 Methods and Research Framework

How is the economic value of non-timber forest products measured?

3.1 Introduction

This chapter discusses the methods of measurement used in the economic evaluation of non-timber forest products (NTFPs)in the household economy of the Paser indigenous people of East Kalimantan in three research villages –Rantau Layung, Pinang Jatus and Muluy. Because of the nature of NTFPs, it is important to undertake the assessment in a transparent and scientifically sound manner at the local level. The methods used for the assessment were developed based on references by forest economists (Gregory 1987; Panayotou& Ashton 1992; Godoy &Bawa 1993) and by botanists (Kesler&Sidiyasa1999; Valkenburg 1997; Sliket al. 2006), ethno-botanists (Matius 2005; De Jong 2002; Leamanet al.1991), economist (Sykes 1996) and anthropologists (Colfer 1997; De Beer & McDermott 1997; Persoonet al. 2004).

This chapter begins with the methods of measurement used in the economic evaluation of NTFPs. I will first explain the process used to select the researchvillages; I will then provide details of the methods and site selection used in this section. This is followed by details of the preparations for fieldwork in Samarinda (the home base of the researcher) and on the relations between the villagers and the research team, the fieldwork procedures and the data collection in the villages. Finally, I will describe the methods used for data collection outside the study area, the methods used for the collection of data relating to commercial rattan extraction and the methods of data collection in the district capital and province of Samarinda. Also discussed are the methods used to analyse the interregional marketing flow of NTFPs. The next section discusses the constraints of data collection and how the data are used for the calculation of household inputs. Finally, I will discuss the use of data to evaluate the household output values and modelling of the village economy.

3.2. Methods of measurement used in economic evaluation of NTFPs

3.2.1 Research village selection methods

In any socio-economic study, it is important to undertake preliminary investigations of the target population prior to conducting the work. To this end, it was necessary to make a preliminary reconnaissance visit to Pasir, in order to organise institutional agreements such as research permits, and to gain a good understanding of the conditions at the potential study area. This preliminary visit, which took place during January-February 2004, provided an opportunity to select and identify the villages to be studied, and to select the local fieldwork team. In addition, a number of local organisations were contacted, and interviews were conducted with their representatives, including the Head of the District (*Bupati*), the District Forestry Department, the District Agriculture Department, the Provincial Bureau of Environmental and Protection (BAPEDALDA), the District TransmigrationOffice, and some NGOs and the private companies, such as logging and mining concessions. Last but not least, I also visited the indigenous community leaders in each village (*Kepalaadat*).

Subsequent field visits were arranged to the district capital and villages surrounding the GunungLumutProtection Forest (GLPF) and extension areas. A total of 13 villages were visited during the preliminary survey, with the aim of obtaining an overview and insight into the general patterns of NTFP use in the region, and in order to observe the interactions of indigenous peoples within the GunungLumutProtectionForest. Based on areconnaissance visit at the beginning of 2004, three of the 13 villages visited during this preliminary survey were selected as research villages.

The criteria used for the selection of the three villages were:(1) distance to GLPF, with a preference for villages close to the forest;(2) ethnicity (with the presence of Paser Dayak preferred);(3) use of NTFPs, with active NTFP use preferred.

The specific village research sites in each village were selected on the basis of their current use of NTFPs, their willingness to cooperate with the research team, and their position in relation to the Gunung Lumut Protection Forest. The importance of selecting villages close to GLPF was also to conform to the objectives of the Tropenbos research project, since GLPF had been selected as a focal area for theTropenbos Kalimantan Programme.

After the selection of the research villages, village heads were invited to participate in the study as paid field assistants. In each case, they agreed to join the research as a member of the team. During the pre-study period, all field assistants were given a short training and supporting material (notebooks, pencils, GPS, etc.) to prepare them for the fieldwork. It was assumed that by including the village heads in this way that this would ensure community support for the study and, specifically, that the gathering of data from households would be easier. In addition, a comparison could be made of the impact of different income sources on the level of well-being of the people in the different villages.

The data collection was conducted from April 2004 until the end of 2007, during fieldwork periods of two to three months. This fieldwork was interrupted by visits to Leiden University (CML) for data analyses and thesis writing from February to April 2005, from March to May 2006, and finally, from April to June in 2007.

3.2.2 Selecting the students and the field assistants.

Contact was made with students of the Faculty of Forestry at the Mulawarman University, Samarinda, with a view to possible participation in this research project, through the office of Tropenbos International in Balikpapan, and through the Faculty of Forestry itself. Students expressing an interest were briefed in full on the rationale and methods of the research project. Those students who were selected were also given an introductory training and were provided with literature for further reading, in order to familiarise themselves with the general background of the research project. At the same time, in consultation with the selected students, a number of contact persons in the district were identified, who could potentially provide information for the benefit of the study. In total, six undergraduate students were selected to be involved in the research project. Initially, it was planned that the six students would be distributed equally into the three villages selected in the research area. However, this turned out not to be possible, since their topics were interrelated. Finally, it was decided to ask the selected students to work together with the principal researcher. As a research team, we moved to the different villages one by one, after completing data collection for each village.

The first field data collection was conducted in Rantau Layung, Muluy and Pinang Jatus at the beginning of April 2004. These three villages were also visited to make a formal agreementwith the Adat Chief (*KepalaAdat*) and villagers, requesting permission to conduct the studyand to use their village facilities. In all cases, a very positive response was received, making it clear that the village heads concerned were keen to participate. I also agreed to share the outcomes of the study with the villagers, for their possible benefit.

3.2.3 Preparations in Samarinda prior to travel to the study sites

After the research proposal was approved by the supervisors in December 2003, the researcher returned to Indonesia and started to prepare the field visits. This included the preparation of introductory letters for visits, as well as the collecting of supplies. The time was also used for the selection of students from the Mulawarman University. In principle, the six selected students organized their research independently, however, they received clear instructions on the research objectives and research questions from the prinicipal researcher. They were supervised both by the principal researcher and by their own supervisor at the Forestry Faculty in relation to the development of proposals, fieldwork methods and data analysis.

The students used the data for their thesis diploma, since this is a requirement for the Faculty of Forestry. Each student was obliged to conduct a research project and write a thesis on the basis of field research, for the finalization of their study at the university.

We also visited the Provincial Forest Department in Samarinda to discuss the theme of research with the Head of the office. This revealed interesting information, especially in terms of their current interest in sustainable forest management and also in the use of non-timber forest products. We also discussed the role of the forestry sector in the provincial economy and the current issues related to my research in East Kalimantan.

3.2.4 The importance of interaction between the fieldwork team and the villagers

Due to its economic and political history, Pasiris a district that can be described as a 'transitional economy'. It is a district with high levels of poverty and hardship for local communities. The Pasir District, within the province of East Kalimantan, is among those districts with little economic and political influence. This has been the case since colonial times. To some extent, the population of the district had a reputation of being 'lazy, poor and mystic.'Local communities in this district have not been widely consulted on development issues compared to other districts in Java. As a result, the majority of Paser people have very low incomes compared with other ethnic groups in the region, and they often live below the BKKBN 'poverty line' (LPMD Pasir 2005).

In rural areas in many parts of Indonesia, small local communities are often suspicious of strangers. Although an element of this exists in the local Pasir societies, they tend to be more trusting and straightforward in their dealings with people from outside. Once a stranger has been accepted into the community, then there is trust. In my research, it was important to foster a certain level of trust and acceptance between local communities and the research team, in order to ensure the smooth operation of data collection.

In general, the lives of the Paser people have been controlled by the local government, and permits (obtained via the district government) are necessary before visits can be made. As part of the permit process, the local authorities made field visits, to investigate the proper implementation of our research, in line with the permits. An important aspect of our fieldwork was the relationship between the team leader, students, and the field assistants, and the villagers themselves. Due to the nature of our research, especially with respect to the planned participatory research activities, it was essential that there be a commitment by the field assistants to the overall objectives of the study. They also had to be aware of the real relevance of the research to the local community. I succeeded in doing this by selecting village heads who were interested in the objectives of research, and who sincerely felt that it may have some benefit for Paser people. It was possible to build a degree of mutual respect and trust within the team and with the villagers. The feeling of mutual respect and trust clearly influenced the way local people responded to the interviews in which they participated.

The idea of selecting village heads as field assistants was key to the principle of participatory research. The inclusion of the *Adat* Chief was also important, as these people already had a relationship of respect within the village. By coincidence, two of the five students involved in the research were also from the Paser District and were fluent in the local languages and dialects. Their knowledge contributed to a positive attitude of the villagers towards the research team, creating a bond of respect and trust. When the team was introduced to the villagers, the students contributed to a good collaboration.

3.3 Fieldwork procedure and data collection in the villages

3.3.1 The introductory meeting

Upon arrival in each research village, we first met withthe *KepalaAdat* or village community chief, who is the traditional head of the village. The researchers went first to the house of the *KepalaAdat*, where a short introduction was given about the research team and the objectives of the research.After this initial welcome, the team gave a brief explanation of the research and the working plan,and also indicated the timing of the research. The introduction was not only important for getting to know eachother, but also to explain the objectives and methods used to conduct the interviews, the time available and the preferred location of the interviews.

Most of the villagers attended these initial meetings with the village heads. Indeed, almost all households were represented on these occasions. This was even the case when some men were out collecting rattan or hunting or cutting trees in the forest. In each village, the team of researchers were introduced by the *KepalaAdat* or by the *Kepala Desa* (Head of the village). A brief talk was given on the objective of the project, explaining the interest in sustainable development and what it may mean to a community such as theirs.

During the meeting, lists were made of the people involved in various activities, such as rattan harvesting, handicrafts and hunting. The names of those absent from the meeting were also noted. These lists were later used to build up a picture of which households participated in which activities. This greatly helped the team in identifying those households that could be included in the surveys of the various activities. Diaries were distributed to one member per household, and detailed explanations were given of how to complete them. Due to the high level of literacy in Pasir, it was not a big problem to find someone from each household, capable of completing the diary.

During the meetings, questions were allowed, and on each occasion a number of people had questions about why the research team was there, how their village had been selected to participate, and what the research was for. Some people wanted to know if the researchers were from the government, or from some department or company. It also became clear that it was an advantage that the team was not formally representing government or the private sector, since this gave more independence. It was also made clear that there would be no direct benefit to the village in terms of monetary income or future investments as a result of the study and that there would also not be a negative impact from the research. Finally, it was stressed that the research may have longer-term benefits through an impact on policy.

At the introductory village meetings, it became clear that the term 'sustainability' was something that most of the people had heard off, although a small number of people had never heard the term. On the whole, the ideas underlying the concept were something that the majority of villagers understood. They were clearly able to link the concept with their own experiences. Although an interest in the concept of 'sustainability and development' was present, it was apparent that, for most people, feeding the family and improving the standard of living were the highest priority.

Throughout the study, it was made clear that there would be no payment for the participation in surveys. In each village, the introductory meeting was brought to a close after about an hour, and a group photograph was taken of those present. At the end of the meeting, a representative of the group (usually the village head) once again welcomed us to their village and confirmed their willingness to participate.

There is no doubt that incorporation of the Paser field assistants into the project contributed to the success of our field research. This had a positive influence on the attitude of local people and, thus, on the quality of the data collected. The fact that people in the survey villages felt they were talking 'to one of their own', had an important impact on the details of the collected responses. The informal nature of the interviews conducted with participants also had a beneficial effect.

For the purposes of analysis, the data collected were standardised, with pre-structured survey forms, across households. The assistants completed these pre-structured data recording sheets during and sometimes after the interviews. The forms were designed to keep the interviews as informal as possible, rather than being a highly structured interview with strangers. The fact that field assistants were also farmers in their own rights (their wife, or their children, or they were sons of farmers) helped to ensure that data recorded was realistic, and representative of the actual situation in their village. It was unlikely that respondents would give unrealistic responses to the questions when the enumerators understood the local situation. In any case, the fact that Paser people are straightforward and honest by nature, also helped in proper data gathering.

3.3.2 Participatory mapping and landuse of the villages

After meeting with the villagers, the next task was to develop a participatory village map and to identify the location of houses, farms, forest areas and other features, such as the rattan gardens, honey, river, the school and settlement. This was done using a participatory process that involved all of the people in the village. The participatory mapping was conducted in two steps: step one was conducted in the house of the *Kepala Adat*, using an existing map of the village developed by the local government as background information. A larger-scale copy of this map was made, which was easier forthe local villagers to read. The existing map was produced in 2001 by the local government, without the participation of the villagers. The enlarged copy of the map was put on the wall of the meeting room and one by one the participants were called to indicate their home, farms (land), forest area, rattan gardens, and paddy rice cultivation. The entire process took almost a week to complete, at which point all households had located their household's properties on the map.

The second step was to make a comparison of the map with features in the field, in order to check the accuracy of the map. The research team was accompanied by the villagers during this field visit, which was guided by the traditional village head (*Kepala Adat)*. It was assumed that he is the person with the best understanding of the village area and its boundaries. The process of field checking took almost a month as most of the villagers worked in their garden during this period of mapping. Thus, the research team had to rely on the availability of the villagers in order to complete the mapping process. As part of this process, we also visited the areas of the village that border with other villages. This was usually done by using a small canoe (*ketingting*), or by walking through the forest area. We also surveyed village boundaries using a car. This also provided an opportunity to visit former logging concession areas. This kind of transportation had to be used because the distances covered were great and the surface areas claimed by the villagers was usually very large. For example, according to a map prepared by the local government, the village surface area of Rantau Layung is 18,000 ha. However it was difficult to check the boundaries in the field, since most of the area is covered by natural and secondary forest, with river forests and mountain forest. Other important data were collected during these field checks, this included the position of rattan gardens, honey trees, coffee or agriculture crops, paddy rice cultivation, as well as determining who the owner is. The position of gardens was documented using GPS and gardens positions were marked in the participatory map.

After finishing field checks, the villagers were again invited to look at the new map and to double check the location of their rattan garden, honey trees, farm or paddy rice cultivation, cash crops, and settlements. This process was conducted in the meeting room of the village head. During this process, many participants corrected the position of items such as boundaries of farmland, also in response to the claims by others. One of the important results of this participatory mapping was that it turned out to be a good tool for the villagers to try to remember and recognize their land and farm boundaries, from one family to another, by using the river and planted trees inside their gardens as landmarks. Once the boundaries of the garden of a certain family were assigned, with mutual agreement, the others would follow more easily.

The most surprising result of the mapping process was that most of the villagers turned out to know their forest area and its boundaries very well. Indeed, they could recognize that certain land belongs to a specific household. The result of the participatory mapping is shown in figure 5.2 in chapter 5.

3.3.3 Conducting the household surveys

On the basis of the information gathered by the participatory mapping, and the lists of names of the household heads collected during the village meeting, the research team was split up to cover sections of the village and to include all households in the village survey. The field assistants and students worked in pairs (usually one male and female), going first to the households that were the farthest away from the research station (home), then walking towards the centre point of each village. This way, all households in the village were systematically covered.

During the first field visits, conversations were conducted with the male heads of the household, usually by the male research assistant. The senior female member of the households were interviewed separately at this time, usually by the female research assistant. In some cases these structured conversations were conducted with two female members of a household, but usually the interviews were done individually. Each of these surveys took one to two hours to complete, depending on the nature of the household and the character of the person being interviewed. The efforts made to create a relaxed atmosphere for the discussion also meant that more time was needed than may otherwise have been the case. However, this was considered as essential in order to establish trust and to obtain accurate answers from those being surveyed. In most cases, appointments were made with heads of households so that the survey would not interfere with their daily routine. Data from all of these structured conversations were recorded and at the end of each visit, the evaluation was made for the data sheets.

When all of the datasheets were completed, the next stage was to collect data about the farmer's household production and extraction. This was done, where possible, by interviewing a different family member (such as a son, brother or grandfather) from each household. Information on handicrafts, hunting, fishing, rattan harvesting, honey, and other NTFP collection, was then gathered systematically from those households. Structured interviews were also conducted with both elders and youths. All the collected information was compiled by the principal researcher at the end of day, and a daily check was made to ensure that no households were being omitted. Each morning, the research assistants were assigned a variety of tasks for a certain number of households. In most cases, these tasks were completed as planned. In a small number of cases, no one was present in the household and no data were collected. If it was known that there was a temporary absence due to farming or rattan harvesting, the household was revisited later that day. If the household members were still absent, average values for households activities were assigned to that house. If a house was abandoned and had not been used for some time, no data were included.

3.4 Methods for estimating proportion and quantities

Although the Paser people are relatively well-educated (in terms of literacy), it was important to use a standard method to enable households to provide an accurate estimation of quantities of crops produced, or food eaten. In the case of the crop production of rice, the standard-size *kaleng* (15 litres) used in the village was taken as a measure, and the field assistants then converted this measure to the equivalent number of kilogrammes (kg) of rice produced. The unit'kg' was used as a measure of weight. This procedure was effective and efficient, as all households had good knowledge of how many *kaleng* they produced, since they actually had to carry their harvested rice to the households or village hut themselves.

The same procedure was used for rattan harvesting. The standard *tampik* was used as a measure of weight for this product. A *tampik* is a bundle of rattan of approximately 10 kg. For animal hunting, honey harvesting and other NTFP products, measures were used as shown in table 3.1.below:

Table 3. 1. The conversion of local weighting system to standardised system

Products	Local weighting system	Standardised system
Rice	Kaleng	15 kg
Rattan	Tampik	10 kg
Honey	Liter	1 liter
Fruits	bijiatauikat	units or bundle
Fuelwod	Ikat	Bundle
Fish	Kg	Kg
Plant leaves	Ikat	Bundle
Animal hunting	Ekor	Kg
Coffee	kaleng	10 kg
Palm wine	Liter	Liter
Money	Rupiah	Rupiah
Time	Jam	Hour

The pebble method was used to estimate proportions. The interviewee was given 100 small pebbles and asked to share them out to represent the various portions of the items in question. For example, when women were asked about the type of food they ate, they were able to use this method to indicate quite accurately what proportion, by volume, they would consume. This method was also used in interviews with men, when estimating the proportion of farm production used for food in the home. However, many of the men interviewed had a problem with this method, as many of the proportions of products were not documented and were not consumed during harvesting, and the men interviewed often did not remember the proportions.

3.5 Other data collecting activities in the fieldwork villages

In addition to the household surveys, other activities were also conducted to collect background information for the project. To promote friendly and open relations between the villagers and the study team joint sport activities were conducted. A volley ball match between the research team, visitors, and the villagers, (home team), was played every Sunday or sometimes during the week in the afternoon after returning from the forest or gardens. Other activities were initiated to provide a more comprehensive 'snapshot' of the economic and social conditions in each village including:

- Forest walks with the head of village or *adat* chief
- Formal interviews with the teachers, guru *ngaji*or *dai* (*dai*_is a person appointed by local government to facilitate Muslim prayers in the village)
- Collection of soil and plant samples from a number of gardens and the forest
- Group meetings with young, hunters, collectors of medicinal plants, etc.
- Interviews with NTFPs traders, local middlemen, and NGOs
- Visits to neighbouring villages with a senior villager
- Talking during swimming in the rivers
- Collecting honey at night with a group of collectors
- Observations on price fluctuations of industrial (goods), prices in stores (*warung*) and product availability
- Visits to logging camps or concession areas.

All of this information, together with the data from the individual diaries, is used to verify and to cross-check information on the structured data sheets, ensuring a measure of reliability for the data as a whole.

After village data collection, the household surveys were completed, and as many data sheets as possible were collected for each household. A total of 126 data sheets of various types were collected from the village of RantauLayung, 76 data sheets were collected from Pinang Jatus, and 54 data sheets from Muluy. In addition, a total of 82 diaries were collected, varying in quality and quantity. The quality of diaries varied from fully completed diaries, with entries for each day of the survey, to those containing only sketchy information about the family for just one or two days. Altogether, the surveys included in this study cover 123 households, representing 577 household members.

3.6 Collecting data relating to the commercial extraction of rattan, honey and hunting

Some research has been done on the use of rattan (climbing palms) in the region of East Kalimantan (Valkenburg 1997; Matius 2005; Fried 1997). Since the rattan harvested from this area can be classified as NTFP product, it provides a good example of a product which can be commercially extracted. Rattan grows in clumps of 10 to 70 stems (see Chapter 5 on resource management) of what is known as clonal palms. Clonal palms have the ability to self- regenerate, as long as some part of the original stem and root system are left intact. This requires that those involved in harvesting understand this principle, and it also implies that areas of forest utilised for such harvesting are large enough to allow the growth and regeneration; so, for example, they are not converted for paddy rice cultivation.

Since the economic importance of rattan extraction is relevant to the valuation of NTFPs in the region, contact was made with many companies involved in this in East Kalimantan and South Kalimantan. The company PT. Srikaya, a Banjar Baru based rattan industry, was very cooperative, and made available their records for the market share of rattan in South Kalimantan. Contact was also made with logging companies in order to investigate their role in forest management and their impact on rattan transportation in this region.

The survey team travelled along the river of Kasunge to assess the position and size of each rattan garden owned by villagers, and several sample plots were selected for the measurement of the potential for extraction. During plot assessment we also observed the age of the rattan and the spatial distribution, as well as density. At the plots themselves, we also measured the DBH (Diameter Breath Height) of trees, species of tree, potential for extraction, and the level of regeneration. The overall results of these assessments will be discussed separately in Chapter five.

Data collection also took place in the district capital Tanah Grogot and along the Trans-Kalimantan highway from the SimpangPait to Balikpapan and to Tanah Grogot in the Province of East Kalimantan. Rattan product chains werefollowed up to the factory gate of the rattan processing industries in Banjar Baru (South Kalimantan). In addition, several visits were conducted to collect data from the offices of local district government in Tanah Grogot. These visits aimed to complement the role of NTFPs in the Pasir District economy.

3.7 Problems with data collection

Due to the enthusiasm and dedication of the students and the research assistants, and the genuine interest in the project expressed by the villagers, there were surprisingly few difficulties in the data collection process. The few problems we did encounter had to do with logistics rather than the quality of data collected. These included:

- Time being wasted as a result of research assistants arriving too late to meet with household members, who had already left for their farms (this was solved by making follow-up appointments)
- Time was used up by the need to walk quite long distances around the village. This was a particular issue in Rantau Layung, where the households are widely dispersed. As a consequence, research assistants often had to walk as much as three to five km perday. Some households could only be reached by canoe, which we had to borrow from and paddle with the help of the villagers. However this was not always possible
- On rainy days, the research assistants were not keen to go out early in the morning and needed to be persuaded, or they waited until the rain stopped
- It was necessary to take care and respect prayer times, since there was a strong Islamic influence in the community. This was especially the case when making interviews on Fridays, when most of the villagers went to the mosque.
- Daily checks had to be made by the principal researcher to ensure that no households were omitted
- Food supplies had to be conserved by the principal researcher during each village visit, and care had to be taken to ensure that these were not consumed too rapidly at the beginning of the survey; something some of the field assistants were reluctant to remember
- Transport from village to village took a great deal of time. In particular, Pinang Jatus and Rantau Layung were difficult to reach and transportation was very expensive
- In the early part of the study, some mistakes were made in the interpretation of certain questions (this was corrected overtime)
- It was not always possible to obtain data from all households (due to the fact that the family was away)
- Students or research assistants in Tanah Grogot had more problems with reluctance to reply by those approached to participate in the various market surveys, due to a suspicion that this was some kind of government income assessment for tax purposes
- At the end of the research period, both time and money ran out, and the fieldwork in Muluy had to be carried out in a shorter time span. This was largely due to the fact that visits to Muluy incurred high transportation costs, since it was the furthest village for the research team to reach

- Sometimes the field assistants miss interpreted answers or responses during interviews. Sometimes, these misinterpretations were caused by too long interviews or by the attitude of the householders, who were unwilling to answer certain questions on sensitive subjects.

In spite of these relatively minor problems, the fieldwork was completed effectively, and the research objective was achieved.

3.8 Using collected data to model the village economy and calculate the value of forest inputs

In all types of economies, production results about the inputs of land, labour and capital, and thus any production analysis, require data. The household surveys provided raw data, which not only describes the village households per se, but also provides a foundation for more detailed economic analysis. In the context of the forest economies featured in this research, similar productive inputs are required, and each of these, along with output values, must be included in the analysis. On the basis of the data collected during fieldwork, it became possible to produce an empirical model of the local economy. As a result, the value of natural capital use could be determined.

The need to classify natural capital separately from the overall produced capital was clear, as this approach is conventionally used in economics. It is certainly a pressing issue in the resolution of environmental management problems. In the past, products from natural capital have often been regarded as 'free goods', and this has led to their under-valuation. As a result, a situation has emerged where externalities are said to result from natural resource exploitation. In order to achieve sustainable development, we must remove these external costs, and internalise them by including some value for this natural capital use in our accounting systems. In practice, this may also mean that, as we exploit our natural resources, we must convert some portion of this natural capital into manufactured capital. As Perrings (1996: 235) said: An economy cannot be said to be developing sustainably unless there is the conversion of natural capital into produced capital yields as an aggregate of both natural and produced capital which is non-declining. As in many other countries, this situation also appears to be the case in Indonesia, either at a local level or nationally.

One of the main objectives of this study was to identify the value of income flow from natural capital used as household inputs in these villages. In this case, natural capital is in the form of non-timber forest products and services. In order to be able to calculate the value of these forest inputs, it was first necessary to construct an accounting model of the village economy, based on all of the known inputs and outputs of each household in the village. By using such an accounting framework, it became possible to examine in more detail, the economic structure of the villages as a whole.

3.8.1 Estimating household labour inputs

Household labour was calculated on the basis of the effective working hours of men, women and children. During the fieldwork, information on time allocation by households was collected, and details from older men or women were cross-checked with the household diaries, in order to establish how household members allocated their time between different daily activities. The distribution of this labour within households in each village is shown and discussed in Chapter 6. The figures shown represent the total households hours by activity, calculated on the basis of the collected data, and weighted according to the demographic characteristics of each household.

The annual number of household time budgets were estimated on the assumption that work is done for 306 days peryear, and consists of 51 weeks per year, with Sunday taken as day of rest. This assumption is made on the basis of qualitative data from the households. These data also suggest that the total amount of work done throughout the year varied very little, and no households had any period in which they did not work. In respect of fuelwood, the daily hours reported by households are multiplied by 360 days peryear, since this commodity is needed every day. For non-timber product collection, including rattan, the weekly reported hours are multiplied by the number of monthly working hours in one year and this allows for the calculation of total labour spent on each activity in the whole year (see section 3.13.2 of this chapter).

3.8.2 Labour input values

The value of households' labour supply is calculated using the well-established methodology of *shadow wages*, which is based on the opportunity cost of labour and represents what could have been earned in an alternative labour opportunity (Todaro 1994; Godoy, Lubowski&Markandya 1993). In this case, an alternative labour opportunity is taken to be the potential earnings from rattan harvesting, a marketable labour option available to all in this region. On the basis of data collected from those actually involved in the rattan harvesting, this alternative hypothetical wage rate is assumed to be Rp. 5,000 per hour. This is based on average costs of forest labour in the region. This value is, of course, an accounting value of labour, as opposed to an actual value of wages received by these households.

3.8.3 The contribution of productive capital to the household and village production processes

The method of calculating household capital is based on a wealth-ranking process, which involves the identification of capital wealth items held by each household (Todaro 1994; Godoy, Lubowski&Markandya 1993).This was done by collecting detailed information about the household's wealth from both, men and women in each household. Base prices of commodities selected for the purpose of the calculation of capital stock were identified by a survey of a range of retail outlets in Simpang Pait, thus ensuring a representative price for each commodity. Clearly, some variations exist between the prices of similar commodities from different sources. For example, a *mandau* (a long knife) and a shovel (and other farm tools) may either be produced in East Kalimantan or it may have been imported from the People's Republic of China (PRC) or Taiwan. As a result, there are significant price differences. Even among imported tools a significant price variation exists when comparing the prices of similar goods from the PRC, Taiwan, Malaysia, or Thailand, compared with similar goods from Australia or European countries. To illustrate this: an axe can cost anywhere between Rp. 30,000 and Rp. 75,000 in Pasir, depending on its origin. To try to take these different prices into account when estimating capital values, the prices used for these calculations are computed averages from the various types of commodities concerned.

Some commodities, such as beds and chairs, musical instruments, toys and kitchen equipment, are even more variable in price, depending on the source of manufacture and the quality of the material used. Again, the prices used for these items in this calculation represent a calculated average for the cost of such an item in a Paser household. These calculated averages are not meant to represent the actual purchase price of such a commodity in a city store. For animals, the price of Rp. 25,000 per kg is used as an indicator, based on a price of Rp. 50,000 for a chicken of approximately 2kg. Chicken are sold at between Rp. 35,000-Rp. 75,000 per animal and have been used as the indicator for the price of meat, as these are the most likely animals to be kept in such households. However, we have assumed that this price could be used to represent the meat price for young deer or dogs, which may also be held as animal stock.

Since the villages in the study are a minimum two days travel from the capital, using normally available transportation, the prices of consumption goods and capital items are not the same if compared with Balikpapan or Samarinda. The price difference is the result of both the transportation costs to the area, and the actions of various suppliers. These suppliers often attempt to maximise their profits by exploiting this situation. The value of capital stock in these villages was also estimated by identifying properties per household. Regional price variations were alsotaken into account during interviews in Tanah Grogot, Samarinda and Balikpapan. When commodities were brought in from Balikpapan or Samarinda, the prices used are calculated on the basis of selling prices in Balikpapan, multiplied by 2.0 to take into account the high transportation and other costs associated with trade in this region. The multiplying factor of 2.0 has been estimated on the basis of several price comparisons between the region and the capital, during the fieldwork period. For the commodities that are produced locally by craftsmen, such as canoes and sifters, the price differentials are not applicable. As a consequence, these commodities are priced by using the normal market price in the local markets in the area.

All prices were taken directly from information given by craftsmen, and by surveys in the local markets at Simpang Pait and Tanah Grogot. Table 3.2 shows the regionally adjusted prices used for the purpose of calculating the value of capital stocks in July 2006.

Table 3. 2. Prices used in the calculation of the value of productive capital stock in RantauLayung, Pasir District (Source: interviews during 2005-2007).

Item	Samarinda prices (Rp.)	RantauLayung Prices (Rp.)
Shovel or spade	30,000	55,000
Rake	15,000	25,000
Hoe	40,000	65,000
Manual saw	35,000	50,000
Chainsaw	6,000,000	8,500,000
TV receiver (parabola)	750,000	1,350,000
Plastic bag (karung)	7,500	12,000
Radio	75,000	125,000
TV (17 inch)	750,000	1,250,000
Canoe engine	1,750,000	2,450,000
Mandau/long knife	40,000	60,000
Motorbike	12,000,000	14,500,000
Electric engine	2,250,000	3,250,000
Oil /petrol	4,050	7,000
Water tank (600 liters)	600,000	850,000
Axe	75,000	125,000
Aluminum (roof)	32,500	45,000
Water cup (15 liters)/jirigen	15,000	25,000

In the case of commodities such as motorbikes, outboard engines for canoes and chainsaws,it would not be appropriate to multiply the Samarinda price by a factor of 2.0 because if a person from this area buys such a commodity, it is likely that he would use his own capital to do so.

3.8.4 Household wealth holdings distribution

The spread of wealth within most economies follows a lognormal distribution, which produces the typical shape of a unimodial frequency density function with a rightward skew (Lambert 1993). This type of distribution indicates that most cases fall within lower and middle levels of wealth, while a smaller number are found in the long tail to the right, exhibiting high levels of wealth. The distribution of wealth among households in the village of Rantau Layung revealed that the wealth ranking methodology employed in the field appeared to be reliable as an indicator of how wealth is distributed in the village.

Capital inputs in production have an impact on costs in two ways. One of the capital costs represents capital depreciation, for which a 20 per cent depreciation rate is used and for the cost using the capital (the imputed interest rate), a 15 per cent rate is used in the study.

3.9 Using data to evaluate household output values

Farming is the mainstay of life in these villages, but wild animals and plants also contribute significantly to the diets of forest dwelling people. Due to a lack of purchasing power, buying meat from any outside source does not usually occur in these households, and supplies of fuelwood, roofing and handicraft materials are also important products gathered from the forest, as are medicinal plants. The value of all of these must be included in the village accounts. In the following sub-chapters the valuation methods are further explained.

3.9.1 Farming values

From the data collected from farmers, and cross-checked with the men's and women's data sheets, the monetary value of farm output can be calculated. This calculation is based on the estimated crop outputs, and on prices for those crops in the village itself, or on the local market. The prices were calculated from farm surveys, where farmers reported crop prices plus by often using observations at the nearest market. Averages of these given and observed prices are used in the calculation of farm output values. By multiplying the household output of each crop by its price, it is possible to estimate the monetary value of farm output and by summing up across all households, the value of farm output per village is calculated.

3.9.2 Non-timber forest products values

3.9.2.1 Hunting values

Animals caught in the forest provide a major source of protein for the people of these villages. During the survey period, hunters were asked about their catches, and details were noted of how much was caught and how often hunting and trapping was done. Estimates were produced from this, and annual totals were calculated on the basis of 48 weeks of weekly total staking into account the seasonal fluctuations. Qualitative data from hunters suggested that seasonal variation in hunting does exist, so this seasonal spread was important. Furthermore, the results show that these seasonal fluctuations were expressed by a variation in the types of animals caught, rather than the quantities caught. In the cases where hunting was a side activity undertaken by the household according to the time allocation records, detailed recordings of catches have not been taken, but weight averages were inserted as an estimated value. Since wild boar are caught only by non-Muslims, the figures for these catches are not included in the estimate used as the average value for other hunting households. The figures shown in the appendix 7 represents data based on hunting catches reported in 2005, during the dry season, from April to September. Since hunting is more difficult in the wet season, this figure is likely to produce an overestimate of hunting catches in the area.

3.9.2.2 Fishing catches values

All households were questioned about their fishing activities, and those who regularly work on fishing were asked to participate in a specific interview on this subject. This facilitated the collection of some interesting and useful data about the population's fishing activities, and it enabled some estimates to be made of the value of these fish catches to households. Since fishing is a form of household output, its value needs to be included in the commodities that reflect the economic significance of the forest to its inhabitants. This means that the value of fish caught within its waters must be included in the assessment of the 'economic value' of the forest itself.

Fishing catches are influenced by season, time and location. The length of a fishing trip was calculated from the travel time to the reported fishing site (times two, for the return journey), plus an average of two hours of fishing time. Data on household fishing trips were taken from the heads of households and from the women's data sheets. The values of fishing catches were based on the estimated weights of the catches, the type of fish caught, and the market price of the various fish species. Although a relatively large variety of fish was caught by all fishermen, the fish values are based on the top three fish species caught, using the appropriate market price. For those households where fishing was reported, but no specific figures were collected, estimates of their outputs were calculated based on the average value of catches for all reporting households. This figure was adjusted with a household correction factor, based on the hours spent fishing perhousehold. Although some variation occurs in the proportions of fish used at home, and fish that is bartered or sold, this does not affect the total value of the fish itself to the village, or the extent to which it contributes to the Gross Village Product. Using the collected data on the weight of fish catches for the species caught and the specific market prices for the fish species caught, a relatively realistic figure of the households output of fish can be arrived at. This figure can then be included as one of the output values to the NVP.

3.9.2.3 Rattan harvesting values

Rantau Layung is one of the major villages for the harvesting of rattan canes, and from there, the stems (cane) or rattan parts are taken to the village and collected for industrial furniture processing in South Kalimantan. The values used here simply represent the estimated number of rattan stems (canes) harvested, multiplied by the purchasing price (from the trader or company agent) at the village gate per stem.

3.9.2.4 Wild bee honey production values

The estimated value of honey production follows the same calculation as for rattan. The volume of honey collection was obtained from the data sheets of the households interviewed. The price of honey was determined by the selling price at village level per litre. The total value of honey production can be calculated, since the number of people involved in the harvest and the volume of extraction per person are also known, as well as the selling price of honey at the village gate.

3.9.2.5 Forest food and vegetable collection values

The estimated values of forest plants used for food, vegetables, and medicinal plants in the household were another important part of our research. The actual value of handicrafts, roofing materials, etc., made from forest plants by members of the household, represent another form of household output, which comes directly from the utilisation of non-timber forest products. This highlights the economic importance of these forest products for the well-being of households, and the values should be estimated to cover this benefit.

From the data provided by the household survey, we find that the forest regularly provides food and drinking items that supplement the family diet. Although many of the forest products are seasonal, the different fruiting season of various trees indicates that there is a fairly constant supply of these supplementary foods throughout the year. Other types of NTFP food, such as palm heart, are available all year round and can be collected at any time. The amount of time spent on collecting NTFPs from the forest is determined from the survey data. Using the average weight of plants, etc., brought from the forest on such collecting trips, it is possible to assess the overall weight collected by each household. Proportions of NTFPs used for each household are reported for things such as medicine, food, etc. and from this, the weight of NTFPs used for food and other uses can be calculated.

For the purpose of valuing forest foods and vegetables, a shadow price is used, based on the market prices in Simpang Pait, the nearest market to study area and the place where all products are sold at different prices for different species. In other seasons, other fruits will take the place of these foods, but their prices are determined at village level. Therefore, the price of fruit is based on local market prices. By multiplying the weight of NTFPs used as food or vegetables with the existing or shadow prices per kg, the monetary value of these products can be assigned to this nutritional use of forest plants.

3.9.2.6 Medicinal plants extraction values

Using the method previously described to assess the value of forest food and vegetables based on the weights of plants collected in the forest, and the proportions of that used for medicinal purposes, values for the medicinal use of forest plants can be estimated. Details of this are shown in table 1,part 2. The market price of *Euricoma Longifolia* or *pasakbumi* (widely used for medicinal purposes),is used as a proxy for the value of medicinal plants.

3.9.2.7 Fuelwood collection values

From households' interview data sheets, information was collected about the amount of time spent by people collecting fuelwood. The value of this is based on the assumption of collection rates being, on average, 15lbs or 10 kg per hour. The figure is based on an assessment of fuelwood loads collected during the survey period. Using the local price of kerosene (*minyak tanah*) as a shadow price for fuelwood, the monetary value of the wood can be calculated. From observations in the village, and on the basis of statements by householders, it can be assumed that 10kg of wood is equivalent to one litre of kerosene in terms of how much cooking service it can provide. On this basis, 10kg of fuel wood can be valued at Rp. 7,500.

3.9.2.8 Handicrafts values

Handicrafts are fundamental to the Paser indigenous way of life, as it is through the use of various handicrafts items that food is processed and produced. The monetary value of these handicrafts was calculated based on the craftsman's estimate of the weekly earnings from items made. This estimate is cross-checked by calculating the value of the number of items produced and applying the village market price for each item. These estimates are then converted to annual values, based on 50 weeks of output per annum.

3.10 The accounting framework

The use of an accounting framework to calculate the importance of the forest as a resource is an attempt to overcome the problems associated with conventional environmental valuation. Conventional measures of economic value often fail to account for environmental impacts (Markandya&Perrings 1992), and in the case of tropical forest valuation, the lack of inclusion of the value of non-timber forest products results in an under-valuation of the resource as a whole (Godoy &Syafran 1986). Resource auditing procedures, which may be useful in other circumstances, fail in this case. This is because of problems such as the lack of clearly defined markets, uncertainty regarding both current and future demand and supply of forest products, and the lack of detailed information about how these resources are used.

There are a number of disadvantages associated with the widely accepted United Nations System of National Accounts (Sullivan 1999). The two major ones are the fact that no provision is made either for the inclusion of the value of environmental goods and services, or for the depletion of the resource over time (Repetto 1988). While this study cannot overcome these problems, it does attempt to include some otherwise ignored values. This study also tries to highlight the need for a more holistic approach to forest resource assessment. In addition, the data collected here about current rates of use of NTFPs could be of use to future research attempting to calculate rates of resource depletions.

3.11 Modelling village economy to calculate the Net Village Product

The main objective of the evaluation study was to examine the extent to which non-timber forest products (NTFPs) are important to forest households, and to estimate the monetary value of their worth in such an economy. In particular, my research makes an attempt to extend the valuation process beyond the monetary sphere, to include the flows of natural capital and ecosystem services, which are utilised by households, and to examine these in a way that takes account of the social and biophysical impacts they may have. The data collected from the three villages in my research area reveals how NTFPs contribute to the households as a source of: food, vegetables, income from rattan, income from wild honey, construction materials, fuelwood, medicinal plants, handicrafts, fishing, and the trapping and hunting of wild animals.

As a means of estimating the value of this NTFP use, a model for the village economy is developed, and the value of the Gross Village Product (GVP) is calculated. This model is based on the usual accounting framework, as used in the calculation of Gross National Product, but it is modified to represent the simpler economy found in a subsistence village. The model of the village economy is calculated based on research by Todaro 1994; Godoy, Lubowski & Markandya 1993), which is developed on the basis of the usual equilibrium accounting assumption that:

Value of household input* = *value of household outputs

here:

$$\textbf{\textit{Household inputs}} = wL^h + rK^h + \delta K^h + pfF^h$$

where :

W = *wage rate*

L^h = *weighted hours worked by household h (weighted for men, women and children labour inputs);*
R = *rate of interest for the use of capital in production;*
K^h = *productive capital used by household h;*
δ = *capital depreciation rate;*
pf = *implicit price of each unit of nature (forest) used;*
F^h = *implicit quantity of nature (forest) used by household h*

Similarly:

$$\textit{Household outputs} = \sum_{i=1}^{n} pi\, Qi^{h}$$

here:
i= counter for NTFPs; hunting, fishing, handicrafts, rattan, farming outputs, etc.
pi = price of the good;
Q_i^h = *quantity of that good produced by household h*

All values used here refer to the period of one year and so, for convenience, the time subscript (t) usually applied is omitted. The value of 'savings' (ΔK) is included in this equation as an output, identified by one of the Q_i^h values. However, without inter-temporal household data, it is impossible to identify any specific value for capital accumulation by households. As a result, this value is included in the total of 'value added' associated with the use of the forest.
By equating the value of household inputs and outputs, we get:

$$wL^h + rK^h + \delta K^h + p_f F^h = \sum_{t=1}^{n} piQ_i^h \qquad (1)$$

To build the complete model of the village, then, we need to aggregate the data; the Net Village Product (NVP) is obtained by summing across all households *h*;

$$NVP = \sum_{h=1}^{H}(wL^h + rK^h + K^h + pfF^h) = \sum_{h=1}^{H}\sum_{i=1}^{n} piQ_i^h \qquad (2)$$

The Gross Village Product is converted to the Net Village Product through the process of depreciation, including in Equation (1) as δK^h.

3.12 Determining the value of forest inputs from Net Village Product

The value of pfF^h will be derived as a residual from the completed equation of all other inputs and outputs. This residual represents the contribution made to NVP by the various NTFPs, and each of these is in the form of output values from village activities generated by the use of forest resources. This is shown as the equation:

$$\sum_{h=i}^{H} p_f Fh = \sum_{h=1}^{H} \left(\sum_{t=1}^{n} p_t Q_t^h - (wl^h + rk^h + \delta K^h) \right) \quad (3)$$

Those activities that are forest dependent clearly make a contribution to the economy of the village, and by examining their monetary values it will be possible to assess the proportion of village output which depends on forest utilisation. The use of this framework, therefore, permits a calculation of the value of the forest for the households, and by summing across households, a figure for the value of the forest for the village as a whole, is derived. Percapita values can be calculated by taking account of population size. In all calculations, the exchange rate of US$ 1 = Rp. 9.300 (the rate for September 2006) is used.

Chapter 4

Research Area

4.1. Introduction

This chapter provides an overview of the research area and, in particular, the Pasir District in the province of East Kalimantan. It covers the land use system, climate, soil formation, geography and the socio-economics of the human population. This chapter also examines the situation before and after the new policy of decentralisation that was introduced in 1998. This new policy caused drastic changes, resulting in an increase in local government revenues, an increase in the number of districts, a reduction in the role of forest extraction in government revenues, and the construction of many new district capitals and infrastructural facilities in the province.

The economic development and the associated development of transportation facilities and natural gas and coal exploitation has triggered a significant migration of people from Java and other islands in Indonesia to East Kalimantan during the past 30 years. Consequently, human migration has put more pressure on natural resources and on indigenous communities who live in poorly accessible and under-developed areas, and who manage the land in a traditional way to produce crops for subsistence. Indigenous peoples have been marginalised by these developments. They have been unable to compete with these migrants due to their lower capacity in terms of knowledge and skills as compared to the migrants, who have more education and information.

4.2. Geography and land use

The province of East Kalimantan is located in the Indonesian part of the island of Borneo (figure 4.1 below). It covers approximately 208,657 km^2, which is about 14 per cent of the Indonesian land area. This province consists of 9 districts, 4 municipalities and 1,299 villages with a total population of 3.3 million people (BPS Kaltim 2009). Geologically, East Kalimantan consists mainly of tertiary sedimentary rocks. The soils are mostly alisols, but in the extensive limestone areas North of Berau they are classified as luvisols (Van Bremen in Valkenburg 1997). Local patches of coarse sandy soils (podzols) are found, covered with heath forest (*kerangas*) (Voss 1982).

The climatic conditions of East Kalimantan follow the patterns of a tropical zone with high humidity (an average of 80 per cent), an average monthly rainfall of 122-267 mm, an average temperature of 17-33°C, and a low wind speed (0.7 knot-8 knots) (*Dinas Perhubungan Kalimantan Timur* 2005).

About 70 per cent of its territory is covered by tropical rain forest of various types; from mangrove forest in coastal areas to tropical mountain forest in the central part, and near the Malaysian border in the north. Mangrove and tidal swamp forest occur along the coast and in the estuaries of major rivers (MOF 2005). The extensive swamp forest in the lake area of Kutai and the Mahakam Basin have been influenced by man throughout the history of human settlement. Forests in the eastern part of the province (the Kutai Valley and ridge fold belt, the Bulungan basin and ranges, and the Mangkalihat Karst ranges) originally consist of species-rich lowland evergreen rainforest, dominated by *Dipterocarpaceae* (Voss 1982). Regional variation in species composition is considerable (Kartawinata et al. 1981; Kessler & Sidiyasa 2004; Slik et al. 2006)

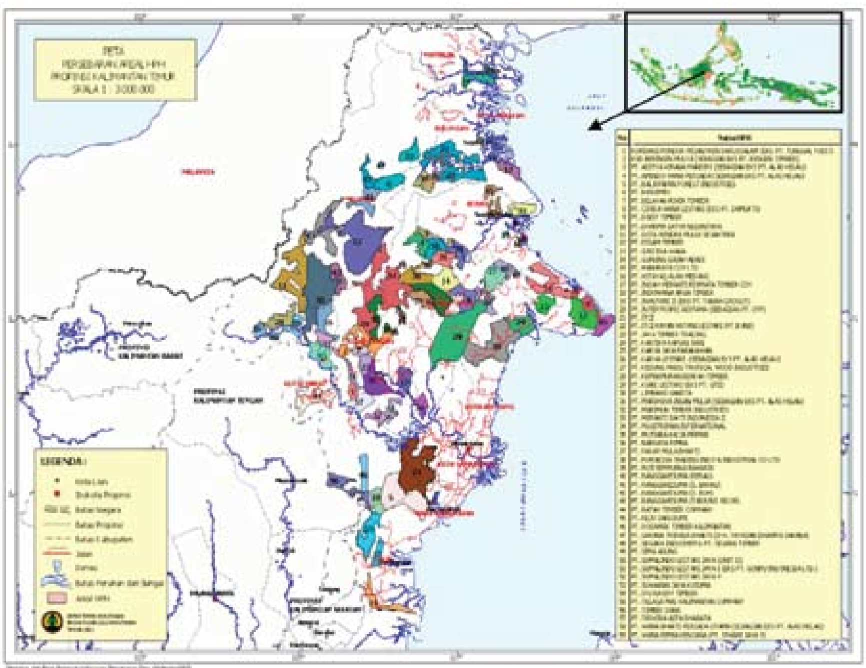


Figure 4.1 The distribution of forest concession in East Kalimantan
Source: Ministry of Forestry 2003

Most of the remnant primary forest is at an elevation of 500-1000 m above sea-level, but mountain ranges of over 1500 m exist in the western part of the province. The presence of logging concessions since the 1970s has changed the vegetation cover of the lowland and hilly area of forest primary forest to secondary forest or even degraded logged-over areas with elephant grass (*Imperata cylindrica).* The number of logging concessions has increased from 65, in the 1970s, to 106 in the 1980s. However, the number of logging concessions has been reduced drastically since 2000. In 2005, the number of logging concessions in East Kalimantan was 61, with a total concession area of 5.89 million ha. According to MOF (2003), the rate of deforestation in East Kalimantan is increasing annually. A late start in the economic-development programme and the concentration of economic development in Java for more than 30 years, are the most important issues to have an impact on deforestation in this province. But, compared to other Indonesian larger islands the remaining forests in this region are in a better condition (MOF-FAO 2006).

The botanical diversity of Borneo is illustrated by the presence of 84 families and 370 genera of vascular plants, comprising at least one big tree species for each genus (defined as either 35 cm DBH or over 20 metres tall), as listed by Whitmore et al. (1990). Ashton (1989) gives an estimate of 10,000-15,000 species of vascular plants (Spermatophytes) and states that the flora of Borneo, and especially the Indonesian provinces of Kalimantan, are still under-collected. Whereas the collecting intensity for Sundaland (excluding the Penninsular Malaysia) is 46 specimens per 100 km^2, the collecting density for Borneo as a whole is only 35 specimens per km^2. Kessler et al. (1992) has added 8500 individual plants to the collection effort. . Kessler's collections mainly comprise trees from the Balikpapan-Samarinda area.

The forest found at the research area is commonly referred to as lowland evergreen rainforest of mixed dipterocarps. This forest type, dominated by the dipterocarp family, is the original vegetation cover of the non-seasonal, lowland areas of Sundaland, comprising the Penninsular Malaysia, Sumatra, Java, Borneo and Pallawan (Richards in Valkenburg 1997). Bratawinata (1986) and Soedjito (1980, 1987) have added some quantitative data on the species composition of tropical mountain forest to our knowledge on the forest in the uplands areas.

The detailed studies by Kartawinata et al. (1981), Riswan (1987) and MacKinnon et al. (1997) have yielded information on the botanical composition of the lowland evergreen rainforest in the eastern part of the province. Kesler and Sidiyasa (1984) provide an account of the economically and ecologically important trees in the Balikpapan-Samarinda area. A publication by Puri (2001) described some 240 species of plants, important from the point of view of ethno-botany, in the northern part of Bulungan, East Kalimantan. This publication has expanded our current knowledge of species diversity and ethno-botany in the East Kalimantan region.

Besides the forest cover, East Kalimantan also has agricultural areas, shifting cultivation and oil palm plantations. The development of timber estates and oil palm plantations has increased the conversion of forest areas by about 2 per cent per year. This conversion has increased further in recent years in areas where the national policy for the development of two million ha of oil palm will be implemented. East Kalimantan is one of the Indonesian provinces that is involved in this policy implementation. Oil palm has, to some extent, been valued as an alternative source for employment opportunity, since a drastic reduction in the forestry industry has reduced the labour input in this sector since 2001. This project is also triggered by the fact that many former logging concessions are viewed as unproductive land and therefore have to be converted to oil palm. Based on the Provincial Statistics for East Kalimantan 2005, we can conclude that the forest area that has been converted to oil palm plantation since the 1980s is close to 600,000 ha and another 1.6 million ha has been converted into transmigration settlement sites, road construction, industrial estates and timber estate areas.

4.3. Population

In statistical terms, East Kalimantan is one of the largest provinces of Indonesia. It is also one of the least populated and the wealthiest provinces in the archipelago. The entire province covers a land area of about 208,657 km^2, which is almost twice as large as the island of Java. In spite of this difference in surface, East Kalimantan has a population of 3.3 million (BPS Kaltim 2009). Per capita income in the province is over triple the national average. Much of this is derived from the extraction of minerals and natural resources, of which oil, natural gas, coal, and logging are the most important.

The southern part of East Kalimantan is a relatively urbanised area with fertile agricultural land and a well-developed road network. The rest of the province is mainly covered with rainforest and very sparsely populated. Road connections within the province and other parts of Kalimantan are underdeveloped, which explains the relative importance of air, sea and river transport.

Administratively, the province is divided into eleven districts and four municipalities. Samarinda is the provincial capital and the new district capitals are: Sangata, Malinau and Melak, which have been growing faster than the older district capitals in the province since 2000.

Compared to other districts in the province, the Pasir District is more developed in terms of agriculture and this is the first district to be involved in the programme for industrial oil palm development, launched by the Department of Agriculture in the 1980s. The surface area of Pasir District is only 10.42 per cent of East Kalimantan province and it has a total population of 171,000 people, which represents 6.24 per cent of the total population of the province. The average population density in the district of Pasir is 7.90 people per km^2 (*Kalimantan Timur Dalam Angka* 2007).

4.3.1 Demography

The regional geographical distribution of the population in East Kalimatan is extremely unbalanced. More than half of the population lives in the urban centres of Balikpapan, Samarinda and surrounding areas. The remainder of the population is concentrated in small towns along the coast. The inland part of the province is virtually uninhabited.

Between 1961 and 1990, the population of East Kalimantan increased from about 550,000 to almost 1.9 million people. In this period, the average annual population growth consistently exceeded the national average, and was also higher than the growth rate in other provinces in Kalimantan. Since the 1970s, a large number of transmigration villages have been established. The influx of migrants has contributed to the very high population growth rate of over 6-10 per cent per annum. Without transmigration the population of East Kalimantan would have increased from 1.9 million in 1990 to 2.4 million in 2004 (assuming a natural growth rate of 3 per cent per annum). The actual population in 2004 was 2,750,369 people. When analysing this figure, it is important to take into account that since 1990 about 200,000-350,000 people have migrated to East Kalimantan (BPS Kaltim 2006). There is no indication that transmigration will slow down in the near future, although the forestry sector has shown a reduction in labour absorption. However, this will be replaced by an extensive development of oil palm plantation, which will provide new employment opportunities.

Unlike many other provinces in Indonesia, out-migration from East Kalimantan has been negligible, although it has been on the rise since 1990. This suggests that many immigrants find life in East Kalimantan satisfactory and do not feel the need to return to their area of origin, presumably because of abundant job opportunities and relatively high wages (the second highest wage level after Jakarta, the country capital).

Table 4. 1. Population of Pasir District, East Kalimantan, and Indonesia, 1961-2004

Regions	Population (million)					
	1961	1971	1980	1990	2000	2004
Pasir					0.267*	0.175
East Kalimantan	0.6	0.7	1.2	1.9	2.6	2.75
Rest of Kalimantan	Na	4.4.	5.6	7.2	9.3	10.64
Indonesia		119.2	147.3	179.2	210.4	218.6

Source: *Pasir dalam Angka, 2004, Kalimantan Timur dalam Angka 2004, GOI Population projections 1990-2020. *in 2001 Pasir district was divided became two district; Pasir and Paser Penajam Utara.*

Between 1997 and 2004, the population of East Kalimantan increased by almost 600,000 people. Most of the population increase took place in the southern part of the province. Immigration accounted for a significant portion of population growth in the cities of Balikpapan, Samarinda, Bontang and Tarakan. The Statistical Bureau of East

Kalimantan estimates that spontaneous immigrants may account for over one third of all immigrants (or 150,000 since 1990). The rapid increase of the population of Pasir District can also be attributed to spontaneous transmigration (see table 4.1.above).

4.3.2 Cultural and social aspects

There is a large diversity of linguistic, religious, cultural and social aspects of population groups between the various regions in East Kalimantan. Malay and Bugis immigrants, who are mostly Muslim, are a majority in the southern part of the province and in most coastal areas. In the northern and northwestern parts of the province, there are sizeable minorities of ethnic groups and indigenous Dayak peoples. Some 80 separate regional languages and dialects are spoken in East Kalimantan (Devung 1997).

Three ethnic groups can be categorised as indigenous to the inland of Borneo: the Kutai, Dayak and Banjar. Dayak is the term for the indigenous peoples who occupy the interior part of Borneo. The majority of Dayak converted to Christianity over a hundred years ago. The Kutai ethnic group dominates the area of the Mahakam Basin and the middle part of the Kutai Basin. The majority of the Kutai people are Muslim. The Banjar groups dominate some parts of the city of Samarinda and trade in the region.

At the present time, the majority of East Kalimantan communities are exogenous, mainly consisting of Buginese, Javanese and other migrants from Sumatra, Sulawesi and other parts of Indonesia. These groups mainly occupy the coastal region of East Kalimantan and are found especially in the urban centres and industrial areas. They dominate the government and private sectors, and they are also dominant in the political system, demonstrated by their influence in provincial politics and the economy. Another ethnic group that must be mentioned is the ethnic Chinese. They are small in number, but have strong influences in the local economy and on the social life of East Kalimantan. To a large extent, they control the business sector and the distribution of industrial goods in most of the urban areas, such as Samarinda, Balikpapan, Bontang and Tarakan. These exogenous groups overshadow the majority of indigenous people in economic terms.

Despite a high heterogeneity in the language and dialects spoken, as well as in the religion, ethnicity and culture of the population of East Kalimantan, ethnic conflict has been very rare. At least in, less conflicts have been reported in this province compared to others such as West Kalimantan (*Sanggau*), Central Kalimantan (*Sampit*) or in Sulawesi (Poso) and Maluku (Ambon) island. This relative stability and absence of conflict may also be one of main reasons why both the economy and population of East Kalimantan is growing faster than other provinces in Kalimantan or Indonesia.

The Paser people, who live in the Pasir District, see themselves as Dayak. This awareness of their ethnic background has become even stronger since the ethnic conflict in West and Central Kalimantan between Maduranise and Dayaks, which began in

1994. The Paser would rather be identified as Dayak, rather than Pasir Mayang or Banjar (Maunati 2004) [2].

Most of the indigenous peoples in Borneo (Dayak) are descendants of immigrants who arrived from Southern China (Taiwan) 7000 years ago (Bellwood 1997). They were hunters and gatherers and only recently settled down as shifting cultivators. Although some form of primitive agriculture or selective use of plants leading to 'wild gardens' is believed to have existed in Borneo for the last 5,000-6,000 years (Hutterer 1984; Bellwood 1997), they have lived in and interacted with the forest for thousands of years. They possess and practice their own unique traditional knowledge to utilize and maintain the forest. They are highly dependent on various resources for subsistence and their main resources come from the primary forest, young and old secondary forests, rice fields and home gardens (Matius *et al.* 2003).

4.3.3 Employment

Although the economic structure of East Kalimantan is very different from the rest of Indonesia, the structure of the labour market is broadly similar. As in most other parts of Indonesia, the services sector has replaced agriculture as the single most important source of employment and now provides almost 50 per cent of all jobs. The agricultural sector is characterised by a significant degree of underemployment, and the proportion of the agricultural workforce has declined continuously in the 1990s as the growth of employment opportunities in other sectors, notably mining and manufacturing, allowed labour to move into more remunerative occupations.

Data on employment in forestry are not available as these figures are now included in statistics for the agricultural sector. According to the Regional Committee of the Indonesian Association for Timber Companies of East Kalimantan (MPI 2007), forestry related jobs cover about 6-8 per cent of the total employment in the province; most of these forestry jobs are in logging. The importance of wood processing has decreased with the increasingly short supply of logs and the influence of the international markets, which continue to show a preference for certified timber. This increasing demand for certified timber implies a reduction in Indonesian plywood exports, due to the unavailability of certificates signifying sustainable forest management. Until 2007 only two out of 65 logging concessions in East Kalimantan were able to obtain a sustainable timber certification from the Forest Stewardship Council (FSC).

In the period 1994-2004, almost 370,000 new jobs were created in East Kalimantan, mainly in services and manufacturing (BPS Kaltim 2007).While employment in forestry and mining has increased substantially since 1990, there has been a negative

2 To some extent the term Dayak is also used for the Christian people of Borneo (Commans 1990; Maunati 2004), but this perception is only present in the area where the influence of Islam is not as strong as in the southern part of Pasir where they have very close interaction with Banjar (an ethnic group that is heavily influenced by Islam) (see also *Artha, Kaltim Post*, Dec 312005).

trend since 2000 for the forestry sector. The agricultural sector registered net job losses during the Nineties, which were particularly high in 1997, but after 2000 this sector showed an increase in job opportunies. Growth of direct employment in mining and manufacturing was about 40,000 – less than 25 per cent of total employment growth – during the 1990s (although the two sectors accounted for over half of total GDP). Since 2000, this sector has shown steady growth in job opportunities.

The oil and gas sector, which now accounts for almost 70 per cent of the province's GDP, employs less than 20 per cent of the total labour force, but provides many opportunities for people to work in informal sectors [3] (BPS Kaltim 2009).

Table 4. 2. Labour market structure of East Kalimantan and Indonesia 1994 and 2004 (% of total labour market).

Sector	East Kalimantan (%)		Indonesia (%)	
	1994	2004	1994	2004
Agriculture and forestry	38	36	44	41
Mining	4	7	2	3
Manufacturing	11	13	13	12
Services	47	44	41	44
Total	100	100	100	100

Source : *Kalimantan Timur dalam Angka*, 1995, 2004/05 Statistik Indonesia, 1995, 2004/05
/a includes forestry (logging only)

Welfare indicators suggest that the wealth of East Kalimantan has benefited the local population to a considerable extent. Disposable income, such as the proportion of per capita GDP is much lower in East Kalimantan than in most other provinces of Indonesia. This suggests that a relatively large proportion of the regency's domestic product is not spent on wages (low labour content), nor is it spent in the regency itself; rather, it is spent externally (leakage).

Mining and oil and gas related activities have a relatively low labour input, since these are relatively capital intensive activities. In 2005, these two sectors accounted for almost 70 per cent of the GDP of East Kalimantan, against 12 per cent of national GDP. In capital-intensive sectors, the proportion of the total income spent on wages is much lower than in labour intensive sectors, which are less important in East Kalimantan than in most other parts of Indonesia.

Gross domestic product (GDP) is defined as the sum of all incomes earned in one year by providers of labour (wages), capital (interest payments and the like), entrepreneurship (profits) and government (taxes). It is likely that a substantial part

3 Informal sector is defined as a job that is not registered with the authorities and without tax payments. Such jobs are not subjected to regulation and government procurements.

of all sources of income earned in East Kalimantan is actually spent in other regions. Firstly, most capital investment in the province is financed from savings generated in other parts of Indonesia or abroad. Payments for the use of capital are, therefore, received by financial institutions outside East Kalimantan. Secondly, there is no large forestry or mining company with headquarters in the province itself. Profits from operations in the regency are typically used to cross-subsidise operations in, for instance, Jakarta. Finally, a significant proportion of taxes collected by the local and provincial governments are transferred to the central government and not spent in East Kalimantan. Taxes on company profits generated in East Kalimantan are usually paid in the province where the company has based its headquarters.

4.3.4 Economy

The economy of East Kalimantan is characterised by a heavy dependence on the extraction of mineral and natural resources, mainly oil, coal, natural gas and logging. In 1997, the GDP of East Kalimantan was estimated at approximately Rp. 20 trillion (constant 1993 prices), or over US$ 8 billion at the 1997 exchange rate (US$ 1 = Rp. 11,000). Rich in mineral and natural resources, the per capita GDP in East Kalimantan (about US$ 4,000 in 1997) is far above the national average, and ranks third behind Jakarta and Riau provinces, the largest oil-producing provinces.

Low in population densities and with an underdeveloped road network, the provincial economy also has the characteristics of an island economy, with high transportation costs, dependence on a limited range of economic activities, and an inflexible market for labour and goods.

Excluding oil and gas, the forestry sector accounts for about 20 per cent of the provincial GDP, against less than 5 per cent for Indonesia as a whole. Manufacturing (unrelated to oil and gas) is as important in East Kalimantan as in most other parts of Indonesia, especially wood processing. Agriculture is of minor importance in most areas of East Kalimantan, except for Pasir, where this district is the main producer of crude palm oil in the province. Although agriculture has contributed 14 per cent of national GDP (1997), this is different in the province of East Kalimantan. Services continue to dominate the provincial and national economies.

The economic development of East Kalimantan can be divided into a period before and after decentralisation (before 1998 and after 1998). Before decentralisation, East Kalimantan's economy was influenced by the implementation of large-scale investment projects, such as the development of offshore oil and gas fields, and the construction of large manufacturing plants and wood industries. After decentralisation, the economic growth was triggered by the government policy to reallocate the tax received from natural resource extraction such as oil, gas and timber, of which East Kalimantan is one of the main producers. Based on the Law of Financial Balance between Central and

Local Government (*UU no. 23 and 25 tahun 1999 as changed by the No. 33 of 2004*) collected tax had to be reinvested in the region, in order to enhance the local economy and to produce commodities.

Before decentralisation or from 1994-1997, the economy of East Kalimantan expanded by 20 per cent, with a peak of 8 per cent in 1996 alone. Rapid growth in the non-oil mining and services sectors (mainly transportation and trading) accounted for over half of total GDP growth in this four year period. The growth in the services sector was fuelled by large-scale investments in agriculture and manufacturing, which more than doubled from US$ 1.2 billion in 1993 to over US$ 3 billion in 1995.

In 2005, after the decentralisation policy was initiated, the economic growth in East Kalimantan increased further, as the province received more tax payments for extracted natural resources back from the central government, as a result of the new Law of Autonomy and Financial Balancing between Central Government and Local Autonomy Region No. 33 Year 2004.

The pattern of economic growth after decentralisation illustrates the dependence of East Kalimantan on the central government policy in the reallocation of tax received from natural resources exploitation. This implies that the economy of this region is still very dependent on natural resource extraction, and this may be the reason why the local government also issued many licenses for the exploitation of timber, coal, and other natural resources in the autonomy era. This is illustrated by the large number of small-scale logging concessions and local licenses for coal mining. The distinction between local government authority and central government's authority is also stipulated in the Law of Financial Balancing System. In this law, authority is differentiated in terms of the scope and scale of business, The scale is defined by its surface area and potential volume of economic benefit that can be generated.

By excluding the oil and gas sectors, gross domestic product increased by almost 10 per cent per annum in real terms during 1994-1997, and by about 40 per cent per annum during 1998-2005, while the income of the local government increased by an average of 200 per cent per annum (2001-2005). [4] (BPS Kaltim 2000).

4.4. Forestry sector

Even though the economy of East Kalimantan is heavily dependent on the exploitation of mining and oil, the well-being of its largely rural based population is still mostly dependent on forest resources.

4 In 1996, the provincial government of East Kalimantan received an annual budget for Rp. 800 billion only. However, in 2005 they received Rp. 4 trillion. The district of Kutai received about Rp. 400 billion from central government in 1995, and since 2003 this district has received between Rp. 2.7 trillion to Rp. 5.6 trillion in 2007.

Of the province's 17 million ha of forests, based on the Forestry Agreement 1982, 10.2 million ha has been allocated for timber exploitation and the rest (6.8 million ha) is allocated for protection forest, national parks, nature conservation areas, and forest conversions for agriculture purposes. It should be noted that no part of the forests in East Kalimantan is formally allocated to local (indigenous) people as a source of non-timber forest products, and the management of their agricultural shifting cultivation system (see map 4.1). Most of the village areas as well as shifting cultivation areas belong to logging concessions. A map produced by the Ministry of Forestry in 2003 (see map 4.1.) indicates this situation and there seems to be a contradiction between the needs of local people for forests as a source of subsistence and the allocation of forests to timber concessions or for conversion to agricultural land. The needs of local people in relation to forests and forest products were not taken into account before the allocation of forest areas for logging.

East Kalimantan is one of the main producers of timber and plywood in the country. Indeed, the province has produced 2 million m^3 of logs annually since 1990, most of which are processed for plywood exported to China, Europe and the US. The plywood industry has been the major source of employment and income for the people in the provincial capital of Samarinda, since the ban on the exportation of logs was implemented in 1983/84. Thirty four plywood industries had been established in East Kalimantan byl the end of 1990s, with a production capacity of plywood of more than 3 million m^3. The booming of the plywood industry was one of the main reasons for the migration of people to East Kalimantan in the late Seventies and until the end of the 1990s. However, this industry could only maintain its position until 2000. After this period, the plywood industry has been in decline and its production and labour input have reduced, due to the shortage of logs as a raw material. Statistical reports about the East Kalimantan industrial sector state that the existing number of plywood industries in 2005 had fallen to only five, from 34 in 1990 (BPS Kaltim 2009).) This condition could exist because the logging concessions and plywood industry were not implementing the certification systems for sustainable forest management (FSC). Most companies managed their business for short term gain and this has serious implications for the sustainability of forest extraction and the overall economy.

4.4.1 Logging

The forests of East Kalimantan contain large numbers of commercial timber species belonging to the Dipterocarp family, of which *Shorea spp*. (meranti), *Dryobalanops* (kapur) and *Shorea spp.* (*keruing*) are the most important. Between 1993 and 1997 reported log production decreased from approximately 5.5 million m3 per annum to less than 4 million m^3 per annum, or about 13 per cent of national production. Forest fires provide an explanation for the low production figure in 1997. The decrease in previous years can be ascribed to the gradual disappearance of easily accessible, high yielding production forests. The Ministry of Forestry has encouraged the development of timber plantations, but plantation development has consistently been set low targets. Timber estate plantation and oil palm plantation are some of the huge projects that required forest land for conversion. On the other hand, the logging companies engaged in timber harvesting are also present in these rural areas. Both developments had an impact on the access of the local people to the forests and and on their ability to gather NTFPs.

Log production from clear-cutting (IPK) increased from 0.8 million m^3 in 1993 to almost 2 million m^3 in 1997. The increase in IPK coincided with a reduction in regular log production from over 4.5 million m^3 in 1993 to about 2 million m^3 in 1997. Field evidence suggests that, so far, logging companies have been far more active in clear-cutting, which is more profitable than regular or even sustainable low-impact logging. Most logs are produced for domestic consumption. Exports are taxed at a rate of 30 per cent.

Table 4. 3. Log production in East Kalimantan 1994-2008 (volume in million m^3)

Source	1994	1996	1996	1998	2002	2004	2008
Regular logging	4.6	3.3	2.5	2.1	1.0	0.5	1.1
Clear-cutting	0.9	1.1	1.1	1.8	1.5	0.6	1.6
Total log production	5.4	4.4	3.6	3.9	2.5	1.1	2.7

Source: *Kalimantan Timur dalam Angka*, 1997 and 2004/2005; Ministry of Forestry 2009

4.4.2 Non-timber forest products

Besides being an important area for the production of timber and natural gas and oil, East Kalimantan is also known for its high biological diversity. This rich biodiversity not only has intrinsic value, but is also important for the livelihoods and the well-being of the local people in remote areas. This has been demonstrated by a number of publications since the late of 1970s (see also Peluso 1986; Kanwil Kehutanan 1987; Valkenburg 1997; Paulus 2003; Sellato 1986). Following these studies, the most important NTFPs in East Kalimantan can be ranked in terms of their potential economic role in the economies of local communities. Rattan, edible birds' nests and animal skins are the most important products extracted for the export market, but in terms of local consumption, fruits, plant material and honey production are the most important NTFPs.

NTFP harvesting in relation to the livelihoods of indigenous peoples (e.g. Dayak in Bentian and Wahau) has been a major economic activity in the northern part of East Kalimantan and especially in the Mahakam basin area. This large-scale extraction dates from the beginning of the 1980s. (Jessup & Peluso 1981; Stockdale 1997; Gonner 2003).

Many researchers have reported the importance of the extraction of NTFPs by indigenous peoples. Jessup and Peluso (1981) studied the functions of the forest for indigenous people's food in East Kalimantan and they considered minor forest products as common property.. Menon (1986) studied the economic value of rattan in East Kalimantan to national revenues. In 1989, Seibert and Lahjie reported on traditional systems of honey gathering in the interior of East Kalimantan. Priaksukmana and Amblani (1988) were the first researchers to study the economic profitability of small-holder rattan plantations in middle part of the Mahakam Basin.

Statistics for East Kalimantan from 2001-2004 reported the importance of some NTFPs in this region in terms of the level of extraction (*Dinas Kehutanan* 2009). However, the volume of extraction is only available for rattan and iron wood shingles. The shortage of data for other products is due to the lack of documentation of NTFP production at village- or district level, and also that district producers do not report their production periodically at the provincial level. This is also one of the reasons why the marketing and development of NTFPs for local income for local people is not recognised by policymakers, since the magnitude of their contribution to the local economy is difficult to quantify.

4.5. Research sites

The Pasir District was formerly a part of the South Kalimantan province. It was registered under the *Kewedanaan* (District) of Kota Baru. The Sultan of Kutai was a traditional ruler in this region, long before Indonesian independence, and Pasir District became part of East Kalimantan province in 1959, after a long process of negotiation between the community of Pasir and the central government. In fact, the community of Pasir preferred to be part of the province of East Kalimantan, taking into account their past relations with the Sultan of Kutai. For example, the former king of Pasir was married to the daughter of the *Sultan* (king) of Kutai, an alliance that strengthened the relationship further (Assegaf 1997; Artha 2005).

Following the euphoria of reformation after the Indonesian economic and political crisis in 1997/98, the Pasir District was subdivided into two smaller districts – Pasir and Paser Penajam Utara. This split was based on the Government Regulation No. 7 in 2002, which also stipulated that four sub-districts of Pasir are part of Paser Penajam Utara District.

The present Pasir District is located in the southern part of East Kalimantan. The district covers approximately 11,603.94 $km^{2,}$ which is about 5.47 per cen of the total land area of the province. The district of Pasir is located some 120 km to the southwest of the city of Balikpapan, between 0^{o} 45'-2^{o}27' and 115^{o}36'-166^{o}57' east. The total population of Pasir District was 175,000 in 2005 and they inhabit 8 sub districts with a total of 109 villages. The Pasir population mainly comprises migrants from Java, Sulawesi (Buginese), and immigrants from Sumatra and other parts of Indonesia. A minority of the communities belong to Banjar and the Paser indigenous people.

Local people in Pasir represent a multitude of cultures, languages, dialects and religions. During the past decade, organised and spontaneous migration of single people, families and whole communities from outside and inside East Kalimantan has resulted in a dramatic increase in the population size, density and diversity in the Pasir area. Four major groups can be distinguished: (1) Paser indigenous peoples; a collective term for the people with different cultures and languages but all indigenous to the inland of Pasir. This group is largely Muslim and they primarily practice swidden agriculture; (2) Banjar people, also indigenous to Borneo but originally from South Kalimantan province; they have a strong presence in government, trading and business in Pasir District; (3) Buginese people, a third major group in Pasir District who mainly occupy the coastal area where they work as fishermen and traders of timber; (4) migrants from other provinces; the majority originate from Muslim communities from East Java, Central Java, West Timor, South Sulawesi and Sumatra and they work in state-owned oil palm plantations; and (5) ethnic Chinese descendants who control the distribution of industrial and manufacturing goods in the capital of Pasir District, Tanah Grogot.

Based on the population census in 2009, the main sources of income of the people in the Pasir District are: agricultural crops and oil palm plantations, forest products, coal mining, fisheries and subsistence agriculture systems. The average annual gross domestic product is 600 billion Rupiah or US$ 75 million (US$ 1 = Rp. 8,000).

The origin of the Paser indigenous people is not clear. Different stories reveal that they probably originate from Sulawesi, or that they are a sub tribe of Dayak Benuag from the upper Mahakam River. The last story is supported by the fact that there are numerous similar words used in both languages. Paser indigenous people consist of four sub-ethnic groups: Paser Adang, Paser Samuntai, Paser Tikas, and Paser Balih. Every community has an *adat* leader selected by the community (Padebang, personal communication, 2004), (University of Indonesia Report 2002), (University of Hasanuddin Report 2002). Weinstock (in Gonner 2002), suggests that people in the Gunung Lumut originate from the Dayak Luangan, a sub-tribal group of Dayak who are found in Meratus and the hinterland of Borneo.

Land use in the Pasir area can be classified into four major categories: forestry, agriculture, settlements, and swampy areas used for wet rice plantation and fish ponds in mangrove areas. The forest area of Pasir consists of production forest, protection forest and conversion forest. Agricultural land consists of shifting cultivation or fallow, oil palm plantation and other agriculture crops. Table 4.4 shows the divisions of land and its area size in the Pasir District.

Table 4. 4. Forest area and different functions in Pasir District

Forest Function	Area Size
• Conversion Forest	103,302 ha
• Protection Forest	116,952 ha
• Limited Production Forest	206,335 ha
• Permanent Production Forest	406,160 ha
• Forest for Research and Education	625 ha
• Convertible Forest	376,623 ha

Source: Pasir District Forestry Office 2005.

The Pasir District has five protected forest Areas, including the Gunung Lumut Protection Forest, which is located inland and at the heart of the district. This forest area is surrounded by four densely populated sub-districts: Long Ikis, Long Kali, Batu Sopang and Muara Komam. The Gunung Lumut Protection Forest covers an area of 35,350 ha and is an estimated 50 km in length and 8 km wide. The area also contains high levels of biodiversity, which has been used for the livelihoods of the people in the vicinity (PPLH UNMUL 2003; De Iongh et al. 2007). The historical background of forest allocation for protection forest by the government is found in landscape planning and based on specific landscape topography and ecology. This protection forest contributes to the region as a source of water and for the protection of wild plants and animals, as well as for its value as a landscape and mountainous area. This area is also the place where traditional shifting cultivation by indigenous Paser people is still taking place.

The forest types of the Gunung Lumut Protection Forest can be described as lowland evergreen forest to hilly and mountain tropical forest up to more than 1000 m above sea level. The Gunung Lumut Protection Forest is surrounded by 13 logging concessions, some of which have been active in forest exploitation since the 1970s. Some of their cutting areas are found very close to or even inside the protection forest. Slik et al. (2007) found that the Gunung Lumut Protection Forest is one of the floristically most diverse regions in Borneo. His study shows that the forest of the Gunung Lumut area is floristically similar to the Meratus region. This implies that it forms a typical example of the floristic regions of South and East Kalimantan. Thus, the area is very important as a representative sample of the forest and for the preservation of its plant diversity.

Three of the 12 villages observed during the preliminary study by the Trade-off Biodiversity Project of the Tropenbos Kalimantan Programme were selected as the base villages for data collection in this study. They were selected because they are Paser villages inhabitants with access to forest and forest products, and also because of their position to the Gunung Lumut Protection Forest. These selected villages are Pinang Jatus, Rantau Layung, and Muluy (see chapter 4).

4.6 The village of Pinang Jatus

The name 'Pinang Jatus' originates from the words of *Pinang*, meaning a palm (*Areca catechu*) used by villagers as a condiment and for utensils, and *Jatus*, meaning one hundred or (*seratus* in Bahasa Indonesia). The history behind this village name was explained to me by Pak Kinken (an old man of Pinang Jatus). He explained that long time ago there was a woman in the old village (before they named it Pinang Jatus), who was found guilty of harvesting a pinang belonging to her neighbour, without permission. Villagers agreed to punish her by forcing her to plant one hundred pinang seedlings in the neighbour's land. This story indicates the importance of such palms for the people of Pinang Jatus. Indeed the palm is still important for the daily lives of these people today and numerous *pinang palm trees* can be found in this village.

The community of Pinang Jatus consists of 56 households, with a total of 265 people in 2005). The village is 24 km from the sub-district capital of Simpang Pait and 65 km from the District capital of Tanah Grogot. This village is located in the northern part of the Gunung Lumut Protection Forest. Like other villages in the Gunung Lumut area, the economic situation of Pinang Jatus is poor due to its lack of transportation and low accessibility to the market. The road is muddy and dirty during the rainy seasons and dusty during the dry seasons. Public transport is hard to find during the rainy season and generally only available during dry periods. The transportation facilities to the village are heavily dependent on logging companies.

The people of Pinang Jatus work mainly for subsistence by undertaking shifting cultivation, hunting wild animals and collecting forest plants. They also have small additional cash crops for generating income. During the last decade, the presence of three logging companies nearby (PT. Telake Mandiri Sejahtera, PT. Mentari and PT. Basuimex), has increased the accessibility and the mobility of the people of Pinang Jatus. The change of the transportation system from boating on the river to the use of cars and trucks has had an important impact on the life of Pinang Jatus people.

In the past, when boats were the main form of transportation, the regular market was hard to reach. It could take several weeks to make the journey to the market and to return home. Today, the market can be reached by car, which saves travel time significantly The improved mobility to the market forced people to get find increasing amounts of cash income in order to be able to buy the attractive industrial goods on sale there. . The accessibility of transportation is much better in Pinang Jatus compared to the other two selected villages in the research area. However, the role of the concession area in Pinang Jatus for economic development is not satisfactory if we compare this with the timber extracted by the logging company. It seems that their claim on the natural resources has affected the opportunities for forest exploitation by local people.

4.7 The village of Rantau Layung

The name Rantau Layung originates from the words '*Rantau*' and '*Lahung*' or *Layung*. *Rantau* means an area of riverside plate and straight and *Layung* and *Lahung* refer to a specific fruit (*Durio kutejensis* Hassk), a member f the durian species, with red pods. The species is common to the forest area of Rantau Layung. Today, *Lahung* trees can be found at the side of the road into the village and this fruit, called '*Buah Lai*', is one of the forest fruits used to generate income for the villagers.

The village of Rantau Layung was selected as a research site due to its position and the nature of its people, a Paser community group. The population of this village are more isolated than the people in Pinang Jatus and Muluy. This village consists of 45 households and it had 206 inhabitants in 2005, all of whom were Muslim. This village is located at the foot of the Gunung Lumut Protection Forest and most of the forest in the village was a former logging concession of PT. Telaga Mas Unlike the other villages in the region, Rantau Layung is only accessible by a four-wheel drive vehicle via a bad road. In 2005, this village could not be reached by car because all the bridges connecting the settlement to the main road of the concession had been damaged. The road conditions have worsened since the logging concession of PT. Telaga Mas left the village in December 2004 and the maintenance of the logging road has stopped. Similar to the village of Pinang Jatus, this village is also surrounded by rich forest resources. The logging company had been in operation for more than 30 years and its departure has drastically reduced the economic potential in this region.

In terms of social relationships, the people of Rantau Layung have a very close relationship with each other and a social barter trade is still conducted to some extent. This is especially the case during 'family gatherings' and funerals, or when celebrating religious days and the start of rice planting (*nugal*). These activities are conducted in the '*gotong royong*' or cooperative. According to the adat chief (*Kepala Adat*) the ancestors of today's inhabitants moved to the current village about 65 years ago, from the lowland of Kasunge River, because their old village often flooded during the rainy season and because the remaining space for land cultivation was insufficient.

The people of Rantau Layung are a forest dependent group and almost all their daily activities are related to the use of forest and forest products, such as the collection of fuel wood, vegetables, hunting of wild animals, fishing, and gathering of other NTFPs. Like the other villages in the Gunung Lumut region, the people of Rantau Layung rely heavily on the forest land fertility by practicing shifting cultivation as a way of producing rice. Their livelihoods are much more related to the fallow system.

4.8 Muluy Village

In contrast to Rantau Layung and Pinang Jatus, Muluy village is located in the heart of the Gunung Lumut protection area. The village was developed by the government (Social Department) in 1999 in order to resettle the indigenous people from Muluy River, about 12 km from the current site. Muluy village consists of 22 households and in 2006 it was home to 108 people. Like other villagers in the Gunung Lumut region its inhabitants are Muslim. The economy of Muluy is far below the overall district level, due to a lack of transportation facilities, access to the market and low government attention.

The Muluy people are highly dependent on the forest and forest products for their livelihoods. There is no market and there is almost no technology in their agricultural system. This, combined with a very low level of government assistance, has resulted in Muluy people being dependent on the forest and forestry activities. Housing construction material, agriculture shifting cultivation, food and the household tools are extracted from the forest. The production of rice and subsistence crops also rely heavily on the forest's land fertility and the availability of land from virgin forest is key to rice production.

The people of Muluy appear to have a better understanding of their adat chief and his rules than the people of Pinang Jatus and Rantau Layung. They view their chief as a dominant factor. This is illustrated by the way they make *ladang* (paddy rice): everybody must ask the chief permission to open up the forest area for clearing. In addition, a new *ladang* must be opened in an area close to other existing ladangs; it is not permitte to make a new *ladang* in a separate location. The villagers say this traditional rule is an embedded strategy for reducing the possibility of crop failures as a result of pest attacks by rats or other natural diseases.

Table 4. 5. Summary of socio and economic indicators of the three research villages.

No	Socio-economic indicators	Villages		
		Pinang Jatus	Rantau Layung	Muluy
01	Distance to market (Simpang Pait)	12 km	14 km	58 km
02	Road quality to market	good	very bad	bad
03	Public transport / car visit	daily	none	weekly
04	The visit of trader/s	daily	unpredictable	weekly
04	Logging Company CSR (corporate social responsibility)	over	over	active
05	Electricity	private	private	concession
06	Motorbike property	low	very low	very low

07	Mobility	high	low	very low
08	Communal property	low	high	very high
09	Share and barter	low	high	very high
10	The use of cash	very high	high	low
11	Role of adat chief	low	high	very high
12	Claim to forest area(communal)	high	high	high
13	Household claim for land/forest	exist	not clear	not clear
14	Education level	low	very low	very low
15	Cooperative culture '*gotongroyong*'	rare	strong	very strong
16	Village status in terms of economy*)	swadaya	tertinggal	tertinggal
17	The involvement in trees cutting	high	low	none
18	Agriculture diversification	high	low	very low
19	The involvement in palm oil	high	none	none
20	The use of NTFP	high	very high	very high
21	The availability of credit (bank loan)	very low	very low	none

*) the status was made by local government in favor of national standard;
swadaya = less develop, *tertinggal*=poor. Source: Field results observation in 2004-2005.

Based on observations from 2004-2005, it seems that this village and its community have a very slow economic and agricultural system. We found that there is almost no innovation in their agriculture and living facilities. The only shift has been the collection of rattan, which began in 2005, following a long period without harvesting. This change was the result of a failure in rice production in 2005, which forced villagers to seek other sources of subsistence.

The fact that the logging concession operating in the area must use the village road to access their sit can be seen as a stroke of luck for the Muluy people, who consequently can claim that there have been many social problems resulting from logging, even though the logging company is currently harvesting far from the village.

4.9 Other comparative village studies

Four other villages were observed during the research period (2004-2007). These villages have similarities in terms of their economic development, number of households (less than 100), ethnicity (all belong to Paser), and religion (Islam). They differ in terms of distance and accessibility to local markets, and the influence of government or logging companies. These villages are: Belimbing (no.4), Rantau Buta (No.5), Uko/Muara Komam (No.7), Swanselotung (No.6), and Simpang Pait, a market centre of the region (see Map 4.2).

Two villages cooperate with logging concessions and two are strongly influenced by palm oil and timber companies. All four villages are located near the river, which has it source in the protection forest of Gunung Lumut. The exact locations of the villages and their proximity to the Gunung Lumut Protection Forest can be seen in Map 4.2 below.

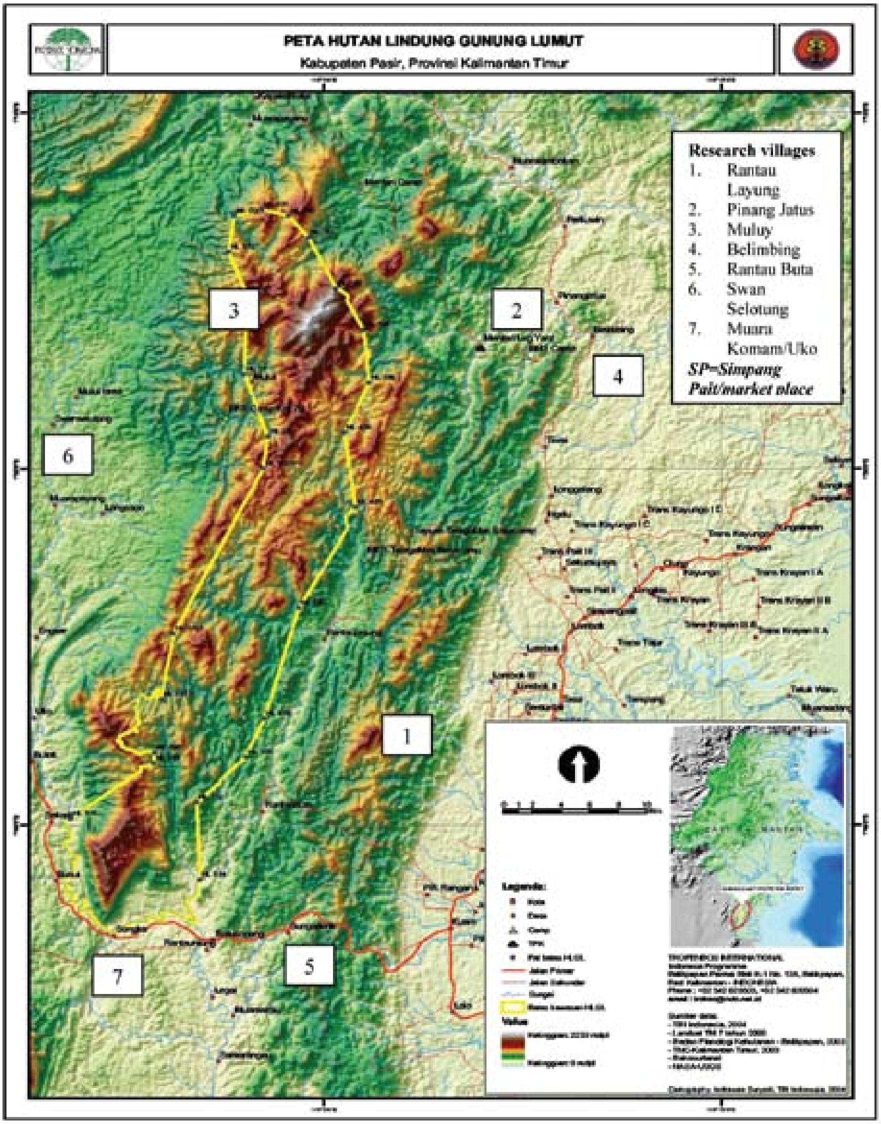


Figure 4. 2. Gunung Lumut Protection Forest and the village study sites
Source: Tropenbos Kalimantan Program, 2005.

Chapter 5

Resource management and the use of non-timber forest products

5.1. Introduction

This chapter aims to describe the resource management and use of non-timber forest products (NTFPs) in the household economy of three Paser villages. Data for this objective were collected by employing various methods: using semi-structured interviews, bookkeeping, focus group discussions, field observations related to forest activities, participatory mapping and plot measurements as have been described in Chapter 3. The identification of plants used was conducted with the assistance of a dendrologist from the Faculty of Forestry of Mulawarman University, Samarinda and the Forest Research Institute of Wanariset at Samboja. The collection of plant specimens was only done if the plants could not be identified in the field. The traditional or local names of the plants were recorded on the basis of information obtained from the field assistant and with the help of people such as adat chiefs, traditional healers, collectors and local hunters.

The plants were categorised based on types of use, as well as on the location where the plant was found or collected by the people. The plant classifications were differentiated into two categories of economic importance – cash generating income and subsistence use. The determination of the possible impact of harvesting on the resource was also analysed by assessing existing harvesting methods.

Observation of traditional land use systems and their role in natural resource management were also made, with the aim of assessing the potential role of culture in resource management. The role of traditional rules in the harvesting and collecting of NTFPs was studied. This was done by observing how people make small rattan gardens, and how they collect wild honey. In addition, how traditional regulations play a role in the competition and mitigation of land claims by villagers was also examined. Finally, at the end of this chapter, a conclusion about resource use is drawn, on the basis of the findings and discussions of the Paser people resource management and their livelihood.

5.1.1 Methods

This chapter is written on the basis of 123 household interviews, field observations, plots measurements, participatory mapping and visits to the nearest markets of the three villages studiedin the period 2004 to 2006. These villages are located in the Paser District and, specifically, in the Gunung Lumut Protection Forest areas. The methods of collecting data and information for this objective have been discussed in Chapter 3.

5.1.2 Research area

Data collection was conducted mainly in the village of Rantau Layung and two other villages – Pinang Jatus and Muluy – were taken for comparison. According to the map produced by the Regional office of Planning and Development of Pasir District in 2003, Rantau Layung village covers approximately 5,000 ha of land, Pinang Jatus is 6,000 ha, and Muluy covers about 8,000 ha. These areas cover primary forests, secondary forests, agricultural and farm areas, rivers, gardens as well as settlements. The total area covered by the three villages within the Gunung Lumut Forest Area, is approximately 52,000 hectares.

5.1.3 Objectives

The main objectives of this chapter are to provide information for further quantification the economic value of NTFPs as will be calculated in Chapter 6. This will be covered by the data about the prominent use of NTFPs, harvesting methods, categories of NTFP use, volume of extraction per household, and the resource distribution of NTFPs. With the aim of assessing the potential role of culture in resource management, we also observed the traditional land use systems and the claims to natural resources. The role played by traditional rules in the competition and mitigation among villagers was also examined. Finally, the conclusion can be drawn that the use of forest and forest products by the indigenous people of Paser plays a substantial role in the rural economy.

5.2 Results: The village study of resource management

My field observation reveals that the basic element of the land use system in the study area is the *umo*,or *ladang* (swidden rice field). In each of the three villages, rice is the main crop for most families. The system involves cutting and burning (slash and burn) the forest cover, normally between June and September. Rice (and other crops) are planted and taken care of (weeding, guarding from pests) and finally harvested. In this area, only one rice crop is harvested from the *ladang* per year.

The development of the rice cultivation area can be easily determined by looking at the fallowand forest areas which have regenerated naturally over long periods of time. (Semok, pers.comm, 2006; see also Colfer et al.1997). The regeneration is possible since the population numbers in the villages are very low in comparison to the availability of the forest area. But in the future this might not be possible as the conversion of forest for non-traditional purposes is increasing year on year (see also Tri 2009). The presence of outsidersin the region encroaching on forest land for business (not for rice cultivation) is having a significant impact and is forcing the local people to reevaluate their use of adat forest and encourages them to claim land for private purposes. Another concern is that adat land can be taken by the local government and then rented out to private companies in the form of HGU. [5] A HGU is a special permit, which allows the land or forest area to be managed by a company for a long period, between 20 and 70 years, for the development of palm oil, agriculture or coal mining. In such cases, there is a real possibility of adat rights being disregarded. This increases pressure to distribute adat forest to households in the village. It seems that the demand for recognition of households' land and certification has increased as awareness of outsiders' occupation grows and in reaction to the insecurity of adat rights in forest areas. [6] This has also changed the attitude of local people from careful husbandry to careless and opportunistic exploitation.

Serious efforts have been made by some adat chiefs to convince and persuade villagers that the worry of losing control of adat forest can be dealt with if the community follows adat rules. However, this command is generally only followed by old families and the chief's relatives, and is disregarded by many young families, in particular those who have lived with urban people. On the other hand, the chief himself sometimes disregards adat law and, as is the case in Perkuin and Pinang Jatus, he has made adat forest the property of his family. Such actions make the management of adat forest even harder. Young families tends to seek an easy way of gathering money for the household's needs and are often involved in selling timber and land to private investors or outsidecompanies. This situation is mainly found in the village close to the area of oil palm plantations and transmigration areas. Forest as common property land can only be maintained in those village areas located in remote parts and with poor access to the market and oil palm plantations, such as in the villages of Rantau Layung and Muluy Interviews with adat chiefs in these villages revealed that:

> '*…we are fully committed to serving our community in many activities, from opening land for paddy cultivation, forest products' collection and rules for the birth and death of men, but we have never been paid by the government like the Kepala Desa have; they sit a few hours in their office for a few days in a month and then they get a salary at the end of month..(Semok, the Adat Chief of Rantau Layung)'.*

5 HGU, *Hak Guna Usaha* is the right to use land, for a period of between 20 to 70 years, and is obtained by private companies from the government for palm oil or other agriculture development. This land allocation is without the consent of the local communities as the land is perceived as belonging to the state forest and part of the conversion forest area. In fact, most of this land has been claimed by local people as belonging to their property.

6 Adat law and its claim to forest land in the Gunung Lumut Protection Forest area has been studied by Bakker (2006). His findings reveal that this claim is the subject of ongoing discussions between the community and the local government.

The different roles of adat chiefs and *kepala desa* are not clear enough to be understood by the villagers; however, to some extent the villagers show more respect to the adat chief, not because the adat chief is older than the *kepala desa*, but because he is more responsible for villagers' lifestyle and he has a vision for the village's future. Unfortunately, this vision is not always understood by the *kepala desa*, particularly in relation to the exploitation of remnants of the forest area.

The dualism of village leadership has provoked many natural resource conflicts between the followers of adat chiefs and the *kepala desas*. The villages of Rantau Layung and Pinang Jatus are representative of this current problematic condition of different arguments and visions about how to approach village development.

It can be concluded that the role of adat and its rules in the management of forests and forest products can only be maintained if there is an institutionalisation of adat supported by local and national government. The role of adat in forest preservation seems to be diminished by the presence of outsiders who appear to be influencing younger generations to exploit and redistribute forest areas for household property. Adat chiefs have many difficulties dealing with forest management since there is no clear policy from the local government to support their (adat right) claim to the forest and to prevent forest areas from being occupied by outsiders and private companies. To some extent, adat administration, rules and claims to forest land are viewed by the government as an obstacle to the economic development of villages and, in particular, to plans to exploit forest resources (Padebang, personal communication, 2007). Lack of government support for adat's role in forest management has reduced the power of the adat chief and this contributes to the degradation of village unity. It has increased the conflict of interests among villagers on forest products and it leads to fragmentation and conversion of their forests.

5.2.1 Traditional land arrangement

If we look at the vegetation of the land, the village of Rantau Layung and Pinang Jatus are encircled by an initial ring of home gardens. Then, there is a ring of farm or shifting cultivation land, including annual crops. This is followed by secondary forest of mixed natural and mature trees. The last ring is an area of primary forest and former logging concessions, the so-called *alas nareng.*

Figure 5.1 describes the current traditional land use in Rantau Layung, based on a publication by CIFOR (2002) and participatory mapping in 2006. This map shows how the people of Rantau Layung differentiated their village land into several categories. These categories deal largely with the function of the land, the vegetation cover and human influences on the land. The main categories are: home garden, *ladang* or rice/paddy cultivation, rattan gardens, rubber, oil palm, and forest area (*tana alas/alas nareng*). These categories determine various factors, such as natural processes, human disturbance and socio-economic purposes. Human disturbance of land, such as logged-over forest area and former shifting cultivation area are categorised as '*Tana alas and Awa pangeramu*'. These traditional terms refer to the main benefits produced from the land and also the historical background of the land.

Tana means soil or land, and *alas* means forest. The same holds for *Awa Pangeramu*, which means the land or place where people can collect various forest and non-timber forest products, like rattan and fruits. The name given to the specific land also describes the geography and historical background of the land, in terms of being the source of NTFPs, or crops, or other valuable purposes. The use of a land certificate as the official recognition of the right to land is not common among the villagers. The claims for specific land by certain households are not valid if there is no proof that the land belongs to the family or ancestors. However, household land is acknowledged in particular in favour of descendants from known parents. The recognition of a household's claim on land is generally through the common understanding of the villagers. There is no clear distinction of land for a newly married couple within the household. They may obtain a new piece of land if they open up a forest area or if it is given to them by their parents.

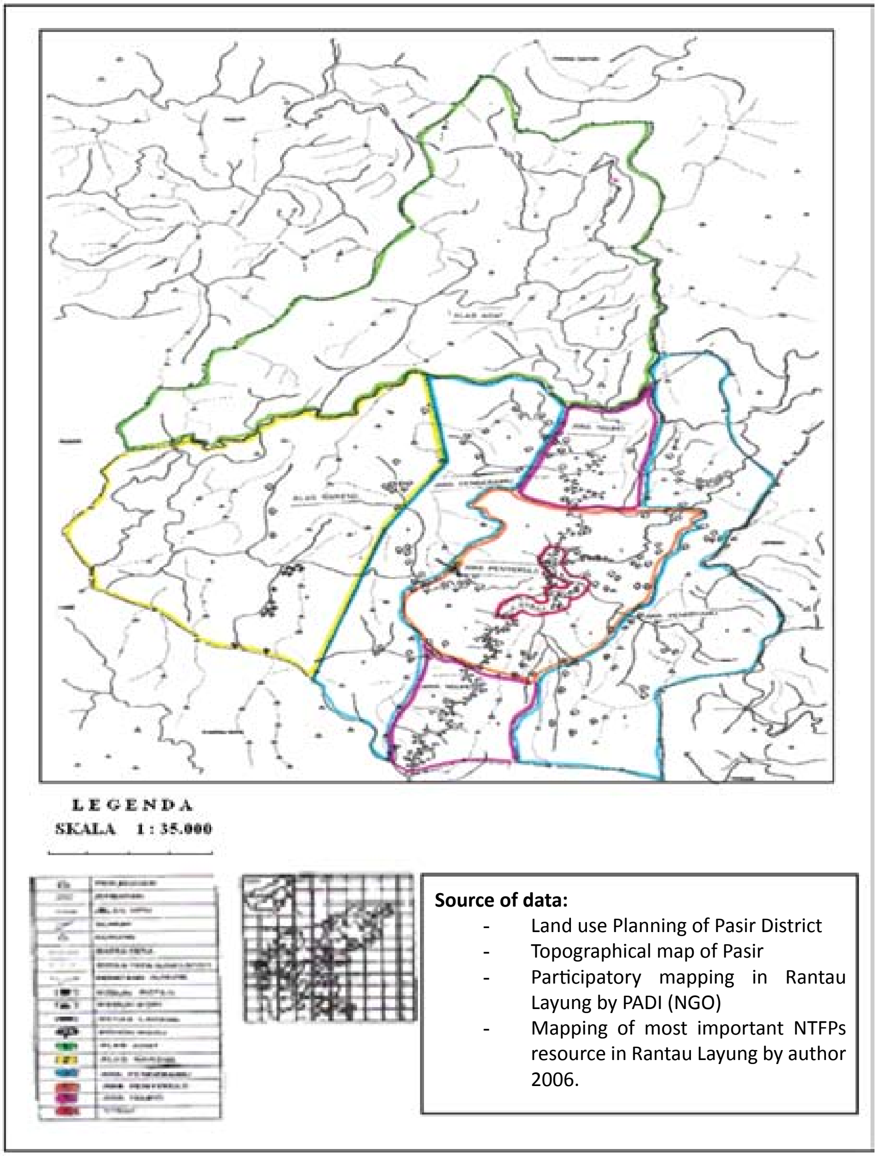


Figure 5. 1. Current traditional land arangement in Rantau Layung

There is usually a common understanding among villagers regarding the recognition of village borders. Field observations reveal that it has become more important for villagers to discuss village borders rather than particular households' claims for forest land. This issue has become important since the introduction of the policy of decentralization, which granted each village a special right to establish a small-scale timber concession within the forest area belonging to the local community. This right was given by the central government as part of a scheme to find resources for the rural economy and to prevent the threatened rural crisis following the wider Indonesian economic crisis in 1998.

Overlapping land claims between villages is common, especially when there is no village participation and intervillage participatory mapping. Fortunately, this condition has not become a source of serious conflict since the policy of giving small-scale timber concessions to villagers was abolished by the government before the clash occurred. [7]

One particular claim by a village that forest land belongs to them was recognised by the border villages but others are still in debate. Intervillage borders are usually recognised by natural landscape features such as rivers, stones, mountains or hills, but they can also be man made, such as fallow areas, graves or field huts. There has been no inter-village participatory mapping in the region to bring clarity to overlapping or conflicting claims.

Table 5. 1. Land use system based on traditional categories in Rantau Layung

No	Land Use	Main formation	Main use
01	Tana Alas	Primary foret/logged over forest	Hunting,trees for contruction, Wild honey bees and NTFPs
02	Alas nareng	Secondary forest (old gardens, Fruit and trees)	Hunting, trees for construction, NTFPs
03	Awa Umo	Paddy rice cultivation	Rice
04	Awa Pangeramu	Secondary forest/Lou lati	Wild honey, palm wine, medicinal NTFPs.
05	Awa Pangekulo/	Secondary forest of rattan gardens,(Lati Piara)	Rattan, fruit, coffee, NTFPs
06	Tana Ekang	Forest which known to have ghost	Cultural/magic, NTFPs,
07	Straat	Area for settlement	Housing, home gardens, grave, public facilities

Source: Participatory mapping in 2006.

7 The Ministry of Forestry of Indonesia issued the policy No.310 in 2000 to allow the people around the forest to harvest timber. It designated 100 ha of primary forest area for each family in the village in response to the local people's demand for reform in the forestry sector. But, this policy was abolished in 2002 because of misinterpretations and its negative impact on forest sustainability (Pioneer 2002).

5.2.1.1 Forest land (*tana alas*)

My field work showed that the traditional land use system in Rantau Layung can be differentiated into: *tana alas* = primary forest, *awa ngumo,* old secondary forest, *awa pangeramu,* secondary forest (fruit gardens), *awa pangekulo* fallow areas, and *alas nareng* the gardens (forest gardens), and the *straat,* settlement. Each of these land uses has a different function in terms of production, but the great difference is only in the type of vegetation cover and the succession of the trees, as shown in table 5.1.

As previously mentioned, the main vegetation cover of *tana alas* are natural tree species and, therefore, the use of this land for the collection of trees and non-timber products is frequent. Non-timber products extracted from this land include wild animals (*rusa* or deer), birds, wild honey and plants for food and medicines. But the extraction of NTFPs in this land is not particularly intensive because of its distance and certain natural features , which can make people scared to enter the land individually. Consequently, the collection of products from this land is usually conducted by groups of people. Indeed, it is hard to find a single person who will enter this area and collect NTFPs all by himself. *Alas nareng* is land of very old secondary forest. This can be part of the former shifting cultivation and former rattan gardens which are no longer productive because the rattan has already been damaged or has decayed due to the tree canopy that stops the sun from penetrating the undergrowth. This causes shadow or darkness, which prevents the young rattan seedlings from growing.

Lou lati refers to the land used for collecting NTFPs. This land is mainly covered by secondary forest or former logging concessions. Wild animals can be hunted here and the main product of this land is wild honey. Wild honey is produced from the Koompalsia trees that grown on this land. Due to its function as a source of wild honey and animals, this land is seen as being common property and so it is subject to adat regulation. Other products produced from this land are palm wine or sugar wine and medicinal plants.

Awa pangekulo or *latipiara* is the land used for rattan gardens or other perennial crops such as coffee, and fruit trees. It is also used for cattle. .This land is found in the alluvial soil of riverbanks. Sometimes the area is flooded during the rainy season, and it is close to the settlement area. Most rattan sega (*Calamus caecius*) cultivation is located in this area. This land is also rich with big trees, some of which are honey trees. People are not allowed to cut these trees because of their position on theriverbank. They are important for soil erosion prevention. This is land used most intensively by the villagers due to its proximity to the houses and its fertility in comparisonwith other land use types.

The land of *awa umo*, is the current paddy rice cultivation and young fallow areas. This land is a place where people practice rice cultivation and where they have their perennial crops. The crops are planted in this land for two years and then they are moved to the more fertile area.

The last land category is *straat*, a term that is probably adapted from the Dutch word meaning street (*jalan* in Bahasa Indonesia). In this context, straat is understood as the settlement area where the houses are built and where the communal socio-economic facilities are.. Each house in the *straat* is built on an individual plot, separated from its neighbours. Usually there is a small home garden on the plot, either at the front or the back of the house.

5.2.1.2 Home garden (*pangeramu*)

The home garden is an agroecosystem that differs from rice fields in many respects. It is a block of land with definite boundaries within which a house is situated. Hence, a home garden is part of a settlement (*straat*). A home garden represents an agroforestry system in the sense that it resembles a forest in structure and combines the natural functions of a forest with those fullfiling the social and economic needs of the people.

The structure of a home garden is based on the presence of many plants species, both annual and perennial. The plants are of different ages and heights, giving a home garden a layered structure (Karyono 1981). The intensity of sunlight gradually diminishes as it penetrates through successive layers of the canopy (Christanty et al. 1980). Accordingly, plants making up these layers belong to sun-loving/tolerance, and shade-loving/intolerance species, respectively. From observations and interviews we have come to the conclusion that the villagers know the light requirements of the plant species and they plant the garden in accordance with these requirements. Undoubtedly this knowledge has been acquired by experience, presumably over a long period of time.

Because of its layered structure and the fact that in most parts of the garden plant litter remains on the ground, the home garden can protect the soil against erosion effectively. It also strengthens the riverbanks where the houses are normally constructed by the villagers. It creates a microclimate that is quite pleasant for people, because the temperature and glare are reduced. The high diversity of plant species also means that the home garden constitutes a rich genetic resource. In addition, the home garden is an integral component of an effective system nutrient recycling that is characteristic of Paser village agroecosystems, because plant, animal and human residues are treated as nutrient sources for production, rather than as waste. Broadly speaking, the home garden stimulates the ecological characteristics of a forest in terms of soil and water conservation, microclimatic effects, nutrient cycling and conservation of the diversity of genetic resources (Matius 2002).

Figure 5. 2. Small-scale traditional *awa pangekulo land* (coffee cultivation) in Rantau Layung (*photo by J.van der Ploeg*)

Thus, the maintenance of traditional home gardens can be considered to represent ecological wisdom. However, there is still debate about whether people acquire this wisdom through conscious efforts, or whether they obtain it incidentally. More importantly, are the people conscious of this knowledge, and do they cherish it, so that they can defend it in times of change or stress? To arrive at and answer to this question, we have examined the functions of the home garden as they pertain to the daily needs of the people in Rantau Layung and Pinang Jatus.

I found that the most important products of the home gardens in Rantau Layung and Pinang Jatus are fruits. This includes forest fruit domestication such as durian, langsat and also exogenous fruit tree species, such as mangos, rambutan and coconut (the list of plants species found in the home gardens of Rantau Layung and Pinang Jatus can be found in Appendix 5).

From the analysis of the plants species found in the home gardens of Rantau Layung and Pinang Jatus, as well as from the observations and interviews, I conclude that the home garden has multiple functions in providing the owner with food and cash income and in serving the social needs of the people. The home garden is considered to have a high social value; it serves as a place for social gatherings, for children to play, and for other social activities. Home gardens in Rantau Layung and Pinang Jatus are typically open, i.e. people can freely enter them or walk through them. Ornamentals are planted to provide an aesthetic environment. The subsistence crops raised in home gardens can provide significant supplements to the daily needs of villagers (see plants used in Rantau Layung). This is particularly true in the areas where the market economy is not well-developed. In such areas, ornamental plants and cash crops play a minor role, while the subsistence production and social functions assume a prominent place.

Thus, it can be concluded that by having a home garden, the people have, without realising it, created a type of forest environment in their living space (house) in which their relation with nature can always be transformed, not just from an economic point of view, but also in terms of the spiritual amenities required by a forest people.

5.2.1.3 Rattan garden

While accounts in the literature differ somewhat from our findings in terms of the sequence of events, the basic elements of the rattan cultivation system in my study area are consistent. Swidden farmers plant rattan seeds, wildings or seedlings, in a newly created agricultural *umo* (or *ladang*) field. The average size of a rattan garden is 1.4 ha, and planting density of rattan clumps ranges from about 50 per ha up to 350 per ha, with a mean of 170 clumps per ha.

The main rattan species cultivated is *Calamus caecius* (known locally as *rotan sega*). Several other species are also grown, including *pulut putih* (*Calamus javanensis* or *C. flabellatus*), *pulut merah* (*Daemonorops crinita*), *jahab* (*Calamus trachycoleus*), *jelayan* (*Calamus ornatus*), *semambu* (*Calamus scipionum*) and several others. However, the taxonomy of these species is unclear. Several species may be included in any given local name. The names given here are based on Valkenburg's (1997) list of scientific, vernacular and trade names of commercial rattan species in East Kalimantan.

The young rattan plants are protected in the *ladang* during the agricultural phase and, when the farmer shifts to a new plot for agricultural production one or two years later, the rattan grows up with the secondary forest vegetation to make a rattan garden. Rattan harvesting typically commences at between 8 to 12 years after planting. *Calamus caecius*, and most of the other cultivated species, have multiple stems and can sustain repeated harvests. Thus, rattan gardens can be harvested periodically overtime. In our survey, individual gardens were harvested, on average, every five years (mean = 4.97 years).

Figure 5. 3. Rattan cane of *Calamus spp.* planted in former rice field, Rantau Layung

Table 5. 2. Estimated potential of rattan harvesting based on age class and species in Rantau Layung and Pinang Jatus.

Age class	Number of Clumps		Potential of Harvesting (ton/ha)	
	Segah	Jahab	Segah	Jahab
7-14.9	28	22	2,020	2,400
15-22.9	22	32	2,600	2,980
23-30.9	27	26	3,190	3,700
39-46.9	20	28	1,887	2,017
>47	20	15	1,300	1,412

Source: Inventory results in 2005

Farmers report that production peaks between 15 to 25 years and begins to decline between 30 and 40 years after planting. After the rattan stems are cut, cleaned and dried, they are sold through a network of traders to the rattan product manufacturing industries in South Kalimantan and other parts of Indonesia.

The main cost is for the establishment (clearing, planting) and for the harvesting and post-harvest treatment of the rattan canes. Rattan seeds and/or seedlings are taken freely from other gardens.

5.2.1.4 Management of honey trees

Honey is another NTFP that is valued highly by the Paser people. Honey procurement in Rantau Layung, Pinang Jatus and Muluy involve the same resource – honey from *apis dorsata* bees with specific trees for nesting, the so-called *wani* trees (Paser term), the tall and clean trees of the *Koompassia* species. These provide the best place for bee nesting and making honey.

The main bee producing honey in this region is a*pis dorsata*, which inhabits the areas from Sumatra to Kalimantan and Sulawesi until the Sumbawa Islands (Rouqetto, in Seibert 1986). The use of honey in Borneo has been known for many centuries in particular by the people of Kutai, Dayak and Tidung in Northern Borneo (Seibert 1986). The involvement of local people in the trade of honey has been recorded since the colonial time until the advent of Indonesian independence (Commans 1987).

Figure 5. 4. Honey bee nests in the branches of a *Koompassia* tree found in *lati piara* land in Muluy village.

Honey management in the Paser area is currently shifting from being a traditional to an individual or family owned activity. This transition began during the differentiation of forest functions and allocations by the government in 1987. From this date onwards, a law eradicated the idea that honey trees were communal property. This law prohibited the use of honey trees in concession areas by indigenous people and restricted their access. They were no longer allowed to maintain or harvest these resources. In fact, many honey trees were taken over by concession workers, thereby disregarding the indigenous people's rights to the forest and honey trees. In the field, we observed several disputes over honey trees between villagers and logging companies. These disputes were never won by the indigenous people because of their weakness in terms of negotiation and access to justice. Honey trees – a potential source of income for the indigenous people – are perceived as part of logging and timber management by the logging companies. Coincidently, many of the productive honey trees were located inside the logging concession area. PEMA, a local NGO, reports that one logging concession has felled hundreds of honey trees without compensation for the community (the owner of the trees). Many of the trees have also been removed in the process of preparing the forest area for oil palm plantation and timber estate. The reduced number of honey trees is one of the main reasons for the annual reduction in honey production in the Pasir District following the expansion of forest conversion.

It could be easy to predict that the existence of honey trees can only be found in remote areas of the forest and far away from oil palm plantations. Logging companies prohibit local people from entering the concession area and this has triggered a loss in income from honey harvesting in the research area. This is in sharp contrast with the forest area maintained by the indigenous people, where the honey trees are maintained and harvested periodically, such as those found in the *tana alas* of Rantau Layung and Pinang Jatus.

Honey production in these villages has been recorded in 2004, 2006 and 2007. There was no production of honey in 2005 due to heavy rains. In terms of the management of honey trees, there is no difference in the resource handling by the inhabitants of the three villages. They have similar management practices of honey production, based on comparable kinds of local knowledge and social behaviour, including prevailing restrictions on harvesting.

5.2.2 Exogenous management

5.2.2.1 Rubber (*Hevea braziliensis*)

During my fieldwork I found that a government-sponsored programme to promote small-holder rubber, teak and coffee has created an opportunity in a limited area in the Pasir District. The first phase began in1980. Farmers involved in the rubber activities were permitted to plant rice and other crops (except cassava), as is done in the traditional gardens, for as long as the rubber canopy was still open. The rubber was sold on the open market.

In almost all cases of planting annual crops, farmers grow rice and some field crops in the first year, along with rubber, teak or coffee. Rubber harvesting begins when the trees are between 8 and 12 years old. Coffee harvesting begins in the fourth year after planting. Tapping of rubber is done daily, and requires 4-5 hours each morning. Post harvest processing involves transporting the raw latex home, curing the latex with acid, pressing it into sheets, and drying it or smoking it. Coffee is processed mainly for home consumption. The plantations of these annual crops differ from one household to another and the trees density is also different, although there are no precise rules in this respect; it depends very much on the owners ideas.

Figure 5. 5. Small-scale rubber garden in Rantau Layung

The main differences between the low intensity and high intensity models are in the planting material used. The rubber project uses high quality seedlings, while the others use seeds and seedlings gathered from nearby gardens. The project model also uses higher labour inputs and more fertilisers and herbicides. The intensively managed rubber produces significantly higher yields than the low intensity model (1.25 tons against 0.84 tons per year, per hectare). In addition, the low intensity rubber gardens in Pinang Jatus are more densely planted than those in Rantau Layung. Farmers in Swanselotung (Muluy) use management practices similar to those used in the monoculture rubber plantations in the village.

As in the other systems, the main inputs of rubber are labour costs for planting in the first year, weeding, fertilising and applying herbicides, buying tapping knives and harvesting. Post harvest processing costs include buying acid and labour for pressing, drying and selling the latex.

5.2.2.2 Oil palm

The current productive oil palm plantation in Pasir was established by state-owned and private companies, as company managed 'nucleus' estates, or as smallholder managed plots within a so-called plasma area. There are now increasing numbers of small private (*swadaya*) oil palm plantations being established, where farmers plant their own oil palms using their own land if it has reasonable access to roads.

In my analysis, I focused on small private plantations of oil palms as these are accessible for individual farmers. The main costs involved are for land clearing, planting, fertilising, herbicides, and tools for harvesting. The main outputs of the traditional system are rice and some fields crops (in year one) and oil palm kernels (beginning in the fourth year). In our sample, the oldest gardens were 27 years. The production of kernel is according to the following assumptions: years 4 to 12 – increased; years 13 to 19 – constant; years 20 to 22 – 15 per centdecrease; years 23 to 25 – 30 per cent decrease (State-owned company of PTP XIII Nusantara 2006).

Figure 5. 6. State-owned oil palm industrial estate in Pasir

5.3 The use of non-timber forest products

5.3.1 Prominent NTFP use

Available statistics for forest products from the Pasir District only list items leaving the district. In the context of this study, the trade volumes for five NTFPs were regularly recorded: rattans (most small size diameter), *gaharu* (eaglewood), wild honey (*apis dorsata*), *sarang burung* (edible birds' nests), *tengkawang* (illipe nuts) and *penyamakan kulit* (reptiles skins for processing) (Forestry Department of Pasir 2005; Department of Trade and Industry of Pasir 2005). The statistical data at district level indicates that the production of NTFPs has been reduced. Every year a number of products have disappeared from the statistical records. This lack of data may be caused by the producers or collectors not reporting their production or sales, but it may also be caused by the fact that the collection or harvesting ceased due to overexploitation (District officer, personal communication, 2005). Products such as eaglewood and animal skins have not been registered in the statistics since 1996 (see Appendix 2).

District internal trade of NTFPs is not documented. Therefore, there are no secondary data available for NTFPs sold at the district level or for forest products whose final market outlet is Simpang Pait or Tanah Grogot. However, it is easily understood that not all NTFPs can be collected in all areas of the Pasir District. *Gaharu*, for example, is only found in higher forest regions of the northwestern mountain range of Gunung Lumut and the Beratus extension areas (Momberg et al. 1994; Peluso 1989; WWF-PHPA 1995). *Kulit Kayu Lem* (glue bark trees) originates from lowland forests along the middle and upper Mahakam River and its tributaries (Dinas Kehutanan 1996; Whitmore et al. 1995). Small diameter rattan found on sale, is not (contrary to a persistent belief by traders) primarily collected from wild forest sources. Approximately 90 per cent of the volume traded originates from extensive rattan gardens traditionally cultivated by people in Borneo in places such as Kasunge, Telake and the upper land of the Kandilo rivers of Pasir. The majority of rattan producers in East Kalimantan are found in the Mahakam and Lawa River Basins (Fried et al. 1992; Godoy et al. 1989, 1991; Haury et al. 1997; Peluso 1991; Soetarso et al. 1988; Fried 1997).

Figure 5. 7. The transportation of rattan segah canes (*Calamus caecius*) in Rantau Layung

Table 5.3 presents the predominant NTFPs surveyed in the research area. The list includes commercial species and products used for subsistence. NTFPs were considered prominent if they were used by, at least, several households during the observation period. The list is arranged in alphabetical order of the commonly-used Indonesian names.

Table 5.4 outlines the harvesting methods for individual NTFP species as practiced in the research area. The estimated impact of these methods on the individual species and its population is also indicated. The table gives information about the level at which the species or products of these NTFPs are marketed, including their subsistence use.

If individual plants of a certain species are harvested destructively during their immature stage then a negative impact on the population was assumed. The same is postulated if several informants complained about serious depletion of the resource because of overharvesting.

Table 5. 3. Prominent NTFPs use in Rantau Layung (RL), Pinang Jatus (PJ) and Muluy (ML)

Vernacular name	English name	Scientific name	Use
Binatang Hutan dan Hasil Binatang	*Faunal NTFPs*		*Meat, trophies and other animal produce*
Babi hutan (bawi) RL, PJ, ML	Bearded pig	*Sus barbatus*	*Meat; large tusks*
Beruang (Biwang latong) RL, PJ	Malayan sun bear	*Helarctos malayanus*	Fangs and claws; meat
Burung Enggang (Nongang) RL, ML	Hornbills	*Berenicornis comatus, Buceros rhinosceros a.o.*	Feathers; meat
Burung Merak (?)	Argus pheasant	*Argusianus argus*	Feathers; meat
Kancil, (Pelanduk) RL, PJ, ML	Mouse deer	*Tragulus javanicus*	Meat
Kijang (Telaus)RL, PJ, ML	Barking deer	*Muntiacus muntjak*	Meat; antlers
Kucing hutan	Wild cats and leopards	some species of Felidae	Fangs; meat
Madu (wani)RL, PJ,ML	Honey	*Apis dorsata*	Used as sweetener
Rusa , (Payau) RL,PJ,ML	Sambar deer	*Cervus unicolor*	Antlers; meat
Trenggiling (Ayom)RL, PJ, ML	Pengulin	*Manis javanica*	Scaly skin; meat
Sarang Burung Walet (Kalo Putung) RL, PJ	Edible birds' nests of certain cave nesting swiftles	*Collocalia fuciphaga Collocalia vaetita*	Made of hardened saliva sticking to cave ceilings; eaten shredded in Chinese 'birds' nest soup'

Vernacular name	English name	Scientific name	Use
Tumbuhan Hutan	*Floral NTFP*		*Food and handicraft material*
Cempedak, Durian, Buah Kapul , dll	Cempedak and other forest fruits	*Artocarpus interger, Durio spp., Baccaurea spp.*	Ripe fruit for direct consumption
Damar	'Dammar' different kinds of hardwood Resins	*Parashorea, Shorea, Hopea, Dipterocarpus spp.*	Formerly used in lacquer and varnish industry; locally used for caulking boats and as a fire starter
Daun Biru	'Blue leaf' 'Licuala palm leaf'	*Licuala Spinosa*	Young unfolded leaves for trad. hat making (Seraung); old leaves as roofing material; for traditional foods
Daun Mekai	'Mekai leaf'	*Aletesia papuana(?) (a small liana)*	Leaves used as condiment
Ipuh , Upas	Dart poison	*Antiaris toxicaria*	Latex prepared into dart poison
Kayu Bawang	'Garlic' or 'onion' tree	*Scorodocarpus borneensis*	Seed used as condiment (nomen est omen)
Kulit Kayu Lem	'Glue tree bark'	*Acronychia spp. (3 species)*	Latex rich bark used in industry as base for incense sticks and mosquito coils
Malau	Gutta Percha	*Palaquium calophyllum, Payena acuminata (also Palaquium gutta, Palaquium leiocarpum)*	Coagulated latex formerly used as insulator for sea cables, today for golf balls; locally used as fixation material e.g. tool blades to handles.

Vernacular name	English name	Scientific name	Use
Pasak Bumi	'Peg of the world'	*Eurycoma longifolia*	Infusion of tap roots drunk by men as aphrodisiac or against back aches
Petai Hutan	'Petai beans'	*Parkia speciosa*	Seeds from large tree pods eaten as condiment or snack
Suling		*Eugenia tawahense*	Latex of tree bark provides pesticidal red dye used in bamboo basketry
Rotan Merah	'Red rattan' (many more local names and species)	Korthalsia echinometra (1) Korthalsia ferox (2)	Sturdy basketry, scoop frames; yaoung cane tips eaten as vegetables
Rotan Murah Seringan ?	'Cheap rattan'	Daemonorops sabut and D. atra	Sturdy large rise drying mats, sturdy basketry
Rotan Pahit ?	'Bitter rattan'	Plectocomiopsis geminiflora	Tips eaten as vegetables and malaria prophylactic; canes not used in area
Rotan Pulut Putih	'White latex' Rattan	Calamus javensis and C. flabellatus	Binding material, fine basketry; furniture industry
Rotan Sega	Rattan Segah	Calamus caesius	Most durable and spliceable rattan; strong and decorative binding material, basketry, mat and webbing making; furniture industry
Rotan Semambu		Calamus scipionum	Large diameter rattan used exclusively in furniture industry

Source: Results of field research 2006

Table 5. 4. Current harvesting methods and marketing level of prominent NTFPs (for explanation of terms see footnotes).

English name	Scientific name	A *	B *	C *	Harvesting Methods	11#	22#	33#	44#
Animals (meat and trophies)	Faunal NTFP				Single animals are shot or caught in traps; 'closed seasons' are not applicable; choice of species limited; choice of individuals not practised				
Bearded pig	Sus barbatus		x		-"-	x	x		
Deer	Tragulus sp., Cervus sp., Muntiacus sp.		x	x	-"-	x	x		
Malayan sun bear	Helarctos malayanus		x	x	-"-	x		(x)	
Wild cats and leopards	sev. species of Felidae		x	x	-"-	x			
Pengulin	Manis javanica		x	x		x			
Hornbills	Berenicornis sp., Buceros sp., a.o.		x	x	-"-	x		(x)	
Argus pheasant	Argusianus argus		x	x	-"-	x		(x)	
Honey	Apis dorsata	x		x	Wild bee hives usually hanging on Koompassia axcelsa branches. The bees are smoked out, the whole hive is harvested.	x	x	x	
Edible birds nests	Collocalia spp.	x		x	The nests are picked off the cave walls, supposedly before eggs are laid or after the young flew out			x	x
Plants	Floral NTFP								
Fruit and leaves									
Cempedak, Kapul and Rambutan (and others)	Artocarpus spp., Bauccaurea spp., Nephelium spp., a.o.	x			Ripe and immature fruit picked off branches and trunks (species often cauliflor)	x	x	(x)	
Durians	Durio spp.	x			Ripe fruit can be collected after falling off the tree when ripe	x	x	(x)	
Garlic tree	Scorodocarpus borneensis	x			-"-	x			
Petai beans	Parkia speciosa		x		The mature tree is felled to reach immature pods on twig tips	x	x	(x)	

English name	Scientific name	A *	B *	C *	Harvesting Methods	11#	22#	33#	44#
Daun Biru (Licuala palm leaf)	Licuala spinosa	x			'Good' leaves are cut off selectively, usually more than 50% of foliage remains	x			
Mekai leaf	Alestesia papuana (?)	x			Leaves are stripped off the stem	x	(x)		
Exudates and extractives									
Damar	Parashorea, Shorea, Hopea, Dipterocarpus spp.	x			Locally only hardened exudates from natural tree damages are collected	x			(x)
Dart poison	Antiaris toxicaria	x			To collected the poisonous liquid sap the tree bark is slashed in diagonal strips similar to methods used in caoutchouc collection	x			
'Glue tree bark' / Kulit Kayu Lem	Acronychia spp.		x	x	Tree is felled and debarked completely			x	x
Pasak Bumi	Eurycoma longifolia		x	x	Saplings are pulled out of the ground to harvest the tap root	x		(x)	(x)
Malau (Gutta Percha)	Palaquium spp., Payena sp.		x		Trees (dbh>40) are felled and exudates collected by ringing the bark every half a meter	x	x		(x)
Suling	Eugenia tawahense	x			Slab of bark is peeled off part of the standing/ living trunk	x			
Rattan									
'Bitter rattan'	Plectocomiopsis geminiflora	x			Tips of mature and immature canes are cut off, inhibiting further growth of the particular cane but not necessary the cluster	x			
'Segah'	Calamus caesius	x		x	Mature canes are cut out of individual clusters, supp. 1 m above the ground (often not adhered, killing the individual)	x	x	x	x
'Red rattan'	Khortalsia spp.	x			-"-	x	x	(x)	
'Cheap rattan'	Daemonorops spp.	x			-"-	x	x	(x)	

English name	Scientific name	A *	B *	C *	Harvesting Methods	11#	22#	33#	44#
'White latex' Rattan	Calamus spp.	x			-"-	x	x	(x)	(x)
Semambu	C a l a m u s scipionum		x		Mature cane of single stemmed species is cut off			(x)	(x)

*harvesting :A = repetitive, B = destructive for the individual, C = destructive for the population / endangered species; #market level;1 = subsistence, 2 = local, 3 = inter-regional, 4 = export.
(Source: Field research 2006)

In Table 5.4 arranges NTFPs according to the biological product used and marketed. The table shows, for instance, that fruits are not necessarily harvested in a non-destructive way to the individual tree, as would be expected for similar products in the northern hemisphere. For rattan the impact of harvesting mature canes depends on two factors. Firstly, whether individuals of the different species that produce cane in clusters is cut far enough from the root to prevent consecutive lethal infection.

Estimating the impact of harvesting on forest animals is even more difficult to assess. Obviously, an individual animal is killed or trapped to obtain meat and trophies. Since the hunting of animals was not only for subsistence, but also for generating income for households, pressure from hunting could deplete certain resources. Reproduction of major meat species is expected to balance out hunting losses as long as their habitat is only disturbed periodically. On the other hand, some rare species are officially endangered. Though commonly occurring in the area any kill or interruption of production cycles may contribute to their extinction. A more detailed description of the prominent NTFPs used in the research area, harvesting techniques and substitutes for these NTFPs can be found in Appendix 4.

5.3.2 Village production of NTFPs

5.3.2.1 Number of species used

My fieldwork reveals that the role of NTFPs in the household is very important in terms of supporting subsistence agriculture activities as well as the household's source of cash income. NTFPs provide tools for cultivation and production such as basketry and handles, and also the materials for hunting and trapping of wild animals or fish. Making tools or agriculture equipment from NTFPs is part of the villagers' daily activities.

Quantitative information on the extraction and collection of NTFPs in the research areahas been calculated by the assessment of households' NTFPs use. This information was obtained from households interviews, measurements, and field observations, as well as by identification of the products' usage (as explained in the research methods of Chapter 3). Based on these methods, it was found that a total of 11 animals and 15 species of plants were used to generate cash income, and more than 117 different plants (identified by their local name) were used for various purposes. 27 different names of fish, and 7 different names of mushrooms recorded and used for the household's daily needs (see also Appendices 5.1 to 5.6 for a list of plants used in the research villages).

The number of NTFPs used, by category, is summarised in Table 5.5 below (and for a more detailed list see also Appendices 5.1 to 5.4). From these tables it is clear that the villagers of Rantau Layung used more NTFPs than the villagers of Muluy and Pinang Jatus. Rantau Layung villagers used 299 species, Muluy used 267 species and Pinang Jatus used 186 species. A similar pattern is also found for the use of wild animals. The people of Muluy hunt a greater variety of wild animals species compared with the other two villages. There are a variety of reasons for differences in the number of NTFPs used among the three villages, including the type and quality of the forest, the market and the socio-economic position of the inhabitants, which will be described in greater detail in Chapter 7.

Table 5. 5. The use of plants in the three research villages, based on categories of use

Categories of Use	Number of plants used		
	Rantau Layung	Pinang Jatus	Muluy
Fuel wood	33	18	37
Construction material	57	26	28
Food and vegetables	85	47	88
Medicinal plants	53	38	56
Traditional culture/ceremony	18	15	23
Various equipments	53	42	35
Total number of plants used	299	186	267

Source: Field research 2007

Table 5. 6. The use of animals in the three research villages, based on categories of use

Category of animal use	Number of animals used/caught		
	Rantau Layung	Pinang Jatus	Muluy
Meat	6	8	7
Trophy	2	2	2
Skin	7	6	8
Cultural ceremony	3	2	5
Fun	5	3	7
Total number of animals used	23	21	29

Source: Field research 2007

5.3.2.2 Volume of extraction

The volume of extraction, consumption and market sales of NTFPs has been calculated based on the methods described in Chapter 3. The result of the calculations are summarised in Table 5.7 below. From this calculation it can be seen that the extraction volume of forest and agriculture products varies from one village to another. The variation between villages and within the village is due to several factors that influence household collection and production (see also Appendices 6.1 to 6.3).

Table 5. 7. Forestry and agriculture production in research villages

Activities	Estimated volume of production (per year)			
	Rantau Layung	Pinang Jatus	Muluy	Total
1. Farm:				
Rice (Kg)	18,388	27,905	9,165	55,458
Crops (Kg)	3,429	2,467	2,393	8,289
Livestock (Kg)	1,965	2,995	1,133	6,093
2. NTFPs:				
Fuel wood (Kg)	60,888	50,000	26,408	137,296
Fishing (Kg)	623	1,883	312	2,818
Rattan (Kg)	50,044	73,200	105,000	228,244
Wild honey (Litre)	233	173	168	574
Handicrafts (Unit)	31	156	37	224
Hunting (Kg)	950	1,723	720	3,393
Palm wine (Litre)	1300	1125	2,414	4,839
Forest foods/fruits (Kg)	3,958	5,780	851	10,589
Other NTFPs (Kg)	9,047	2,400	1,160	12,607
3. Others:				
Mining (Gram)	30.59	-	-	30.59
Logging (cubic metre)	218	373	475	1,066

Source: Field research 2007

Interviews with farmers in the three villages revealed that the main purpose of their overall activities is to make sure that the production of rice is sufficient for one year's consumption.

The differences between villages are mainly affected by the forest conditions and the population numbers in the villages. Almost all types of production in the village of Pinang Jatus are higher when compared with the other two villages. The population number in the village is one possible reason for these differences, as is the distance to old growth forest, land fertility and the accessibility to markets. Based on the calculations for all villages, it is clear that rice production reaches the highest volume of all 14 main activities, followed by rattan and fuel wood collection in the forestry sector. The three villages have similar patterns of subsistence, which are mainly based on slash-and-burn agriculture and collection of forest products. More detailed household production is shown in Appendices 6.1 to 6.3.

5.3.3 NTFP collectors and users groups

5.3.3.1 NTFP collectors

NTFP collection in primary forests was almost exclusively conducted by men. Bachelors are usually the only ones willing to spend long periods of time in the forest. Today, most of the NTFP harvest is used for subsistence and collection takes place simultaneously while working in the forest fields or in the forest gardens. Yields are taken home and processed. Traditional specialities, like collection of dart poison and medicinal plants, are the only NTFPs actively searched for by older men.

Useful NTFPs sighted on long hunting trips are remembered for later collection rather than harvested on the spot. Special collecting trips may be planned to pick up these products. Hunting is done by men of all ages as long as they still feel strongh enough. Young men prefer to hunt with trained dogs and shotguns (usually handmade). Night hunts are also common along the former logging roads with the help of flashlights and motorbikes. Older men and market-oriented hunters prefer to establish long semi-permanent noose-trap lines at walking distance from their villages or near farm huts. Traditional blow piping is rarely practiced. A few older men still use the blow pipes to ward off birds and small mammals from home gardens or cash crop plantations.

Special working groups are formed to collect marketable forest species and when large quantities are sought. Collection trips usually last between one and three weeks. Such trips are often funded by traders who provide loans to be paid back using the targeted forest product. Claimed interest and security of a buyer is often the initial incentive for commercial NTFP collection. In Rantau Layung and Pinang Jatus no commercial NTFP harvesting party was active as prices offered were not considered profitable enough. Groups of Javanese and Timorese people living in transmigration areas close to oil palm plantations however collected fruits and were also involved in hunting within the Rantau Layung territory during the research period.

'*Women do not go into the primary forest*'. This was the predominant answer of female and male informants to the question of whether women ever collect NTFPs from primary forest. Though women are primarily in charge of collecting wild plants for cooking, women do so exclusively in their fields and fallows and alongside rivers near settlements. Even old growth forests bordering their farms are rarely entered by women. NTFP collection groups of mixed gender are an exception to the rule. They are occasionally formed for a one or two day trip to collect large amounts of NTFP that are of special interest to women. Sometimes an unmarried women and her relatives may join commercial NTFP collection trips as helpers or as camp cooks with equal profit sharing, as is often the case of wild honey harvesting.

5.3.3.2 NTFPs user groups

The type of people using certain NTFPs differs almost with each product. Gender, age and socio-economic conditions are criteria delimitating distinct user groups. No single group can be considered more dependent on certain NTFPs than any other. Only one type of household may be called independent of NTFPs. In the following paragraphs I will provide more information on the types of user groups and the range of NTFPs that are collected by them.

Because of the relatively strict traditional division of labour, some materials are processed only by men (e.g. *damar, ipuh, malau*), others only by women (*daun biru,dDaun mekai, suling*). The final products may be used by all members of the household (e.g. diverse types of food, hats, caulked boats and strong farm tools). Other materials are processed by both sexes at different stages (e.g. rattan and game), while the use of the final product is traditionally allocated to one group only (e.g. certain types of rattan for baskets).

Older people usually prefer to use NTFPs rather than their modern substitutes for subsistence. Reasons observed are: (a) familiarity with typical NTFP characteristics; (b) distinct product qualities of NTFPs and substitutes; and (c) the historical/traditional or emotional value of certain NTFPs. An exception is the use of medicinal plants. Older people prefer traditional medicines for fighting diseases above the use of modern medicines.

By contrast, young people prefer industrial goods to forest products where available. It takes less time and knowledge to buy ready-made items than to collect and prepare certain products. The modern image of these products is that they are highly valued. Due to this disinterest, most young people born in the research area have not learned to identify the forest plants, even though some of them are still used by their parents.

5.3.3.3 Contribution of NTFP to subsistence

The collection of most NTFPs needed for subsistence is a task that can be dealt with in one or two days per year, per product (e.g. *damar, ipoh, suling*). These are special products that are rarely used. These NTFPs are considered sufficiently available, replaceable or indispensable. Consequently, they have not developed a local market price and have been neglected in the analysis.

In general NTFP collection for subsistence takes place:

- in old growth forest adjacent to fields and young fallows (*tana alas*),
- while working on the farm fields or while harvesting rattan, and
- during hiking trips. Sometimes special boat trips are made to specific NTFP sites further away, deeper into the forest. These are sites that have usually been detected during earlier hunting or honey harvesting trips.

Only hunting is a fairly regular NTFP related activity. It is valued even if the result is not predictable or satisfying. A successful hunter is highly esteemed in the community. Hunting is actually called a hobby by many men.

Cultivation of some prominent forest fruits and rattan species for subsistence is practiced in local mixed orchards and home gardens. All households in Rantau Layung and Pinang Jatus planted a few seedlings of local NTFP rattan species like the small-diameter rattan of *Calamus caecius*. In Pinang Jatus, cash crops and introduced fruit species dominate local agroforestry systems and especially home gardens. Cultivation of rattan and other NTFPs for subsistence are also reported in Muluy.

5.3.3.4 NTFP in nutrition

Over a period of half a year (May to November 2005) 21 households could be convinced to keep food diaries. Only meals with rice are considered ‘real food’ and diary keepers noted only side dishes cooked and served along with this staple food. For example, they failed to note consumption of fresh fruit and baked sweets that are sometimes served for breakfast or as a snack. In addition, no distinct information was obtained on the amounts eaten per day. However, a total of 2,186 family days dish combinations were recorded, accounting for almost 5,500 meals (2.5 meals a day). Furthermore, the average number of meals containing game, fish, wild vegetables and/or edible forest plants could be calculated.

5.3.3.5 Vegetables

Most vegetables consumed are seasonal and perennial species are inter-cropped in rain fed rice fields or cultivated in home gardens (see table 5.8). In addition, 33 wild growing plant species were eaten in the village as a vegetable, condiment or relish. Further differentiation of habitat and origin revealed the following: 4 species have been introduced into the area as farm crops but run wild, with no further need of tending (e.g. bamboo); 21 species depend on open (disturbed) sites such as riverbanks and young fallows (e.g. ferns and several *Zigniberaceae*); 8 species are collected primarily in old growth forest.

Table 5. 8. NTFPs as a source of vegetables in Rantau Layung (based on interviews with 21 households in 2005)

Habitat of wild vegetables consumed	No. of species recorded	% of species consumed	% of meals consumed
Old growth forest (NTFP)	8	24	5.3
Open/disturbed sites, young fallow	21	64	13.8
Farm and field	4	12	2.6
Total	33	100	21.7

Source: Field research 2005

NTFPs from old growth and disturbed forests represent almost one quarter of all wild vegetables consumed. They obviously contribute to the diversity of nutrition and enhancement of appetite, however, their contribution loses significance if related to the frequency of consumption. Half a year of dietary diaries reveal that 21.7 per cent of all meals provide side dishes containing wild vegetables, but only 5.3 per cent of meals contain plant material originating from old growth or primary forest.

5.3.3.6 Protein

Protein provision in the village was analysed by using the same method that was employed in the previous section. The result puts faunal NTFPs into a different position. Table 5.9 shows that 79 per cent of all meals recorded in the food diaries contained animal protein sources. These are provided by fish, game, meat from domesticated poultry and beef, small amounts of wild animals (including mammals, reptiles, molluscs and insects), but also soy bean products, peanuts, eggs and preserved foods such as canned sardines, corned beef and dried sea fish (*ikan asin*). These preserved goods are categorised as 'imported protein', because they are items not produced in the area, which have to be bought for cash by villagers. Most game meat is provided by wild deer, primates, and also porcupines, pangulins and civets. The amount of meat or fish eaten per day and per person can be quantified by the time allocated to these activities and will be described in Chapter 6.

Table 5. 9. NTFPs as a protein source in Rantau Layung 2005.

Major source of protein	No. of species	% of all protein dishes consumed	% of all meals consumed
Fish	?	49	38.7
Game	8	32	25.3
'imported protein'	6	9	7.1
Domestic animals	4	8	6.3
Other (small) wild animals	8	2	1.6
Total	26	100	79

No.of species as reported and distinguished by informants.
Source: Field research, 2005.

Wild animals are considered faunal NTFP if their population is assumed to depend on old growth or secondary forest. This is deemed necessary to distinguish them from animals whose ecological niche are riverine habitats (fish, but also snails and frogs) or animals that are adapted to and collected in landscapes under agricultural cultivation (e.g. grubs of certain palm beetles, squirrels and certain bird species). The majority of protein consumed in all villages comes from wild sources (83 per cent) and a quarter (25.3 per cent) can be considered true NTFPs.

5.3.3.7 Fruits

The quantitative figure for fruit production has been estimated in the three research villages, but this estimate was influenced by climatic conditions, which inhibited a significant fruit season in 2006. Generally, cultivated and improved fruit species are preferred to edible forest fruits. Only five wild growing forest species – durian, parkia, jackfruit, *langsat* and forest mangos (*asam*) (*durian, lai* or *lahung, petai, cempedak, langsat, and mangoes*), were collected in the forest, consumed and traded in the local market. A total of 17 out of 44 fruit species are reported to have been planted in orchards and home gardens. They are considered endemic forest species (16 per cent), but comprise less than 3 per cent of the individual planted trees (see Appendix 4).

Children are often cited as primary and unobserved forest fruit consumers. Occasionally, observations of their play and talks with older kids and parents revealed that their range of action is rather limited to the village grounds and their parent's farms, fallow and gardens. Clearly, a lot of more fruit species are consumed by children than by adults. Many of these wild species may be growing in orchards and fallows, indicating the importance of these products and of the fallow period of the shifting cultivation fields.

5.3.3.8 NTFP consumption in the forest

An especially interesting case of direct NTFP consumers are the commercial NTFP collectors and working groups of logging companies camping inside the forest. Participatory observation confirmed that the amount of time that can be spent working in the forest is limited by the amount of rice that can be taken along. Most of the working teams live on a diet of rice, canned food, instant noodles and, occasionally, fresh fish from the river.

Old people's stories of families during World War Two and during the long migrations also tell of edible plants in the forest, which today are not known or available in amounts or with a nutritional balance necessary to prevent diseases and starvation. Although palm hearts and rattan tips provide vegetable dishes and relishes year round, their vitamin content is very limited. Most edible forest fruits only ripen irregularly and during relatively short seasons. Preparing staple food from sago (starchy pith of *Eugeissona* spp. trunks) and other edible but not easily processed plants is a laborious endeavour. Furthermore, time allocated for regular hunting competes significantly with the performance of other tasks.

5.3.3.9 Medicinal NTFPs

Plant medicines appear to only play a significant role in Rantau Layung. Indeed, medicinal plants are almost never used in Pinang Jatus now because of the availability and accessibility of the market and the public healthcare facilities available in this village. People prefer and almost exclusively use modern medicines provided by the state or by company healthcare (as is the case in Muluy).Where fresh plant material is used for medicinal purposes, these are usually cultivated spices and fruit species or introduced *Jamu* ingredients.[8]

For a WWF study on 'Dayak Kenyah Forest Medicine', Leaman (1995) surveyed and tested plants and animal products that, according to three Kenyah peoples in the Apau Kayan have medicinal or toxic properties. Leaman found that only 5 per cent of the 200 medicinal species recorded depend exclusively on primary forest habitats. An additional 38 per cent (76) of species occur in primary forest. More than half (57 per cent) of the recorded species were collected and cultivated in young secondary forest and disturbed sites. No data were collected on the actual use of these plants. However, many people in Pinang Jatus appeared to prefer packaged medicines (rarely available) or no treatment at all, to traditional cures.

8 Jamu is the Indonesian collective term for traditional remedies. Originating from Java, over centuries Jamu have been produced from fresh and dried plant material. The concept of use and effect of original Jamu is closely linked with Buddhist and Islamic influences on Malayan culture. Their traditional relevance in Indonesia is only adopted by ethnic groups with Malayan cultural roots (Tuschinsky 1992).

Leaman's report includes a valuable list of species, including vernacular names in the Kenyah Uma Tukung dialect spoken in the Mahakam Basin. In combination with the description of plant species, preparation or remedies and respective applications, this report allows us to cross-check the relevance of this knowledge in Rantau Layung and Pinang Jatus. .

Ten women and nine men of different age groups in Rantau Layung were queried about their knowledge and actual use of 34 NTFPs selected from Leaman's list. *Akapre* is occasionally used in the forest by 8 men. Seven species of plants had been used by 1 or 2 people only. Another 14 NTFP species had never been used and were identified for other than medicinal properties. The users, with one exception, were all older than fifty.

Medicinal use of the species had generally occurred only once or twice in the first year after the move of the informants to Rantau Layung between 15 and 35 years ago. Most people aged below thirty did not know the species or their medical uses at all. This is one reason why they could not be inventorised Names of medicinal NTFP species traditionally known and actually used in Rantau Layung and Pinang Jatus and the number of respective users are shown in Table 5.10 below and in Appendix 5.4.

In Pinang Jatus, the results of the inventory of NFTPs used as medicines or toxins depends exclusively on reports by the informants. When interviewing about medicinal plants growing in old growth forest, 6 out of 17 villagers claimed they did not know any use for these plants. Four respondents stated that they only used the medicinal species planted in their home gardens. Two respondents collected natural remedies in young fallows and on the riverside. Only five respondents mentioned the use of the following NTFP: *pasak bumi* (Eurycoma longifolia), *kayu ulin* or ironwood (*Eusideroxylon zwageri*), *kayu raya,* and *akar sampai* (an unidentified small climber growing in heavily disturbed forest areas). Only the first two species are also included in Leaman's list.

Young men from Rantau Layung could identify only three NTFPs actually used as remedies or poisons. *Akapre* (*Tetracera scandes*) is frequently used in the forest for its properties as antiseptic drinking water. The free- flowing cell water from dissected parts of the stem is also used to wash dry and infected eyes. The latex of *ipuh* (*Antiaris toxicaria*) is frequently collected by older men as a base for rarely used dart poison. The use of *pasak bumi*, a male aphrodisiac and remedy against backaches, has been introduced by Banjarese people. A decoction of the roots is now drunk by young and old men in Rantau Layung and Pinang Jatus.

Pasak bumi (*Euricoma longifolia*) is the only locally available medicinal NTFP plant known to have a market value at the provincial level. This market potential is not yet known to many people within the research area and should not be promoted since its harvesting is destructive to the immature plants and it will reduce the resource.

Table 5. 10. Medicinal plants known and used in Rantau Layung and Pinang Jatus (based on interviews with 21 households in Rantau Layung and 28 households in Pinang Jatus).

Scientific name	Vernacular name	Plant type	Forest type	No. of users in RL	No. of Users in PJ
Calophylum biflorum	Kayu betao	Tree	P m	1	-
Calophyllum sumatranum	Kayu tuwe	Tree	P m	1	-
Daemonorops hallierianus	Uwe seringan	Palm	P m	1	-
Ilex sp.	Lengindan	Tree	M	1	-
Nephelium cf. cuspidatum	Buah abung	Tree	M	1	-
Pongamia pinnata	Tuba jek	Saprophyt	M	1	-
Curculijo lsp.	Lempa'pisa'	Herb	M	2	-
Alocasia longiloba	Udu biak pibang	herb	M	2	-
Embelia ribes	Aka sekilang	Climber	M	2	-
Garuga sp	Kayu juping	Tree	M	2	-
Parkia speciosa	petai	Tree	P	2	3
Syzygnium cf. confertum	Kayu besuk	Tree	m	3	-
Diospyros borneensis	Kayu kelelingan	Tree	P	3	-
Eurycoma longifolia	Pasak bumi	Tree	P	3	3
Homalena rubra var 1.	Lung bileng	Herb	P m	4	-
Trigonopleura malayana	Kayu kelalei lan	Tree	P m	4	-
Tetracera scandens	akapre	Climber	P m	5	5
Scodorocarpus borneensis	Kayu bawang	Tree	P	6	1
Eusideroxylon zwageri	Ulin	Tree	P	6	1
Antiaris toxicaria	Ipuh	Tree	P	8	2
Unidentified	Kayu lung	Tree	M	-	3
Smilax cf barbata	Aka padi	Climber	P	-	-
Litsea norohae	Buah mali	Tree	M	-	-
Homalomena rubra var 1.	Lung bileng	herb	P m	6	-

Notes: P = primary forest; m = secondary forest and fallow

5.4. The major results of the NTFP inventory for potential development

5.4.1. Trees

On average, mature individuals of certain commercial fruit species are seldom encountered, with only one recorded in every fourhectares or even less frequently. No clustering of individual plants on certain sites was observed. The occurrence of *ipuh (Antiaris toxicaria)* appears to be even less frequent. One particular tree, considered an exceptionally rare species by locals, was recognised by informants in Rantau Layung and another tree, was recognised by the people of Pinang Jatus. Though these two trees were shown to the researcher in stands similar to those of the NTFP inventory no *antiaris toxicaria* tree was seen during the survey.

Malau or gutta percha (*Palaqium gutta or P. calophyllum*) has the highest density of NTFP trees in the research area. The relative abundance of *malau* (5.2 mature individuals per ha) has to be explained as the sum of two botanical species (*malau putih (Ind.)* = *Palaqium callophyllum*, *malau merah (Ind.)* = *Payena cuminata*). I estimate that these species are still available in relatively high numbers – 2.6 mature and 52 immature individuals per hectare. Clustering of mature trees and regeneration in the same plots has been observed. Both species seem to prefer well-drained sandy soils.

Pasak bumi (*Eurycoma longifolia*) has an average distribution of 36.2 individuals per hectare. This high abundance has to be explained by the fact that informants were unable to distinguish mature and immature trees. Firstly, this monopodial tree is a small understory species (Stoian 1992). Secondly, all juveniles are considered mature or harvestable as only their tap roots can be pulled out of the ground. In terms of stock, *pasak bumi* has the highest density of harvestable individuals per hectare. Some clustering has been observed. *Eurycoma longifolia* seems to prefer well-drained sandy soils.

Figure 5. 8. Woman is making rattan basketry in Muluy village (photo by author).

Table 5. 11. Stock of selected NTFPs in stands before and eight years after commercial logging in Rantau Layung (inventory results in four ha plots).

NTFP (no. of botan. species) (Name in Bahasa Indonesia)	Primary Forest (1)	Logged over (2)	On average [1+ 2 /2] ind./ha
Commercial fruit:			
Cempedak (1)	0.25	0.55	0.40
All incl.juvenils	0.25	3.31	1.78
Durian (3) mature	0.50	0.14	0.32
All incl. juveniles	15.35	2.35	8.85
Petai (1)	0.25	0.35	0.30
All incl.juvenils	3.00	5.00	4.00
Pasak Bumi (1) mature	0.25	4.70	2.49
All incl.juvenils	56.69	76	67.45

Honey trees (5) taller than 10 m	1.25	2.25	2.00
All including less 10 m	16	14	15
Non Commercial products:			
Daun biru (1) mature	14.85	25.41	20
All icl.juvenils	14.85	39.22	27
Kayu bawang (1) mature	1.86	0	0.98
All incl.juvenils	8.79	2.21	5.50
Suling(2) mature	1.36	0.28	0.82
All including juveniles	1.86	0.28	1.07
Ipoh (1) mature	0	2.00	1.00
All incl. juvenils	o	3.25	1.63
Rattan Semambu (mature) All incl. juvenils	1.25 2.50	2.21 3.50	1.73 3.00
Rattan Seringan (mature) All incl. juvenils	10.40 89.0	5.52 80.25	7.46 84.96

Source: Field research, 2006

5.4.2. Rattans

Palms and rattans *(palmae)* are the only currently relevant NTFPs from the class of monocotyledons found in old growth forest. Useful NTFP species from this family have a generally higher population density than NTFP-producing tree species. According to inventory data, *rotan semambu* (*Calamus scipionum*) is considered to be almost as rare as forest fruit tree species. An average of only one mature individual per four ha has been recorded. Though *semambu* is generaly considered infrequent by local informants this figure has to be taken cautiously. *Rattan semambu* is a durable, multi-functional and easily identifiable rattan species that is in high demand in the market. The scarcity of mature individuals may be a result of overharvesting in the past and the lack of cultivation compared with rattan *segah* (*Calamus caecius*).

Rattan *segah* (*Calamus caecius*) is the most important palm generating income in the region. This species belongs to a small diameter class and grows in a cluster and clonal sprouts if the canes are cut above 1 m from the top of the roots. A calculation of rattans of different age classes on a plot of about four hectares revealed the fact that the cluster density ranges from 67 to 126 clusters per ha. And the measurement in each of the plots revealed that each cluster has 12 to 130 canes with different lengths and ages. The potential harvesting of each cluster was measured and revealed the number of mature canes ranging from 3 to 22 canes or an average of 0.2 to 1.6 tons of raw rattan per ha for one season of harvesting. The maximum potential of harvesting was found in rattan gardens of 15 years old. This age is the peak of rattan *segah* harvesting when compared with the production from gardens of 10 and 25 yearsBased on the mapping and the interviews with the people of Rantau Layung, it is clear that the rattan *segah* plantation in this village was established a long time ago and that this palm is also highly valued for its use for agricultural tools and utensils (see Appendix 9). Its durability is also valued for furniture and export products. Many products made from rattan *segah* are found in rattan processing industries in South Kalimantan. The area size of smallholder rattan cultivation in Rantau Layung and Pinang Jatus was found to be 4.2 ha per household with a total area of 172 ha.

Based on survey conducted in some plots in Rantau Layung and Pinang Jatus it was found a total of 34 species of rattans in Rantau Layung and Pinang Jatus. Of these, only 11 species were recognised in the national and international markets. This means that most of the species found in this region are classified as lesser known species. The market surveys of rattan processing industries in Pasir and South Kalimantan in 2006, it was found that 11 out of 34 species of rattan identified already have a market price.

5.5. Conclusion

Chapter 6 describes the results of the data collection of NTFP use in the research area. Information about NTFP use in three different Paser indigenous villages was generated using various methods of data collection. These data include social and physical aspects of NTFPs.

The research revealed that Paser indigenous people collected various NTFPs from different types of forest and land, such as young fallow areas, secondary forest, and old growth forest including former logging areas. It also revealed that forest and land is traditionally classified into land use categories that are differentiated based on human intervention and natural characteristics.

Traditionally, land use management is classified into: forest for logging, home garden, settlement or home, fallow areas, honey and NTFPs areas, and spiritual forest areas. Each type of land has a specific function which can be differentiated by its products. Different types of land and forest producing NTFPs have been identified.

Based on these findings, it can be concluded that collecting non-timber forest products is a major time-consuming activity, second only to rice cultivation. Almost half of households' labour time is allocated for collection of NTFPs. It has been indicated that without NTFP collection there would be significant unemployment in village areas. The role of the forest as an 'office' for the villagers to generate income or products is another important social aspect, which local governments must take into consideration when developing village employment opportunities.

People's interaction with the forest can only be understood if we adopt a holistic approach to their livelihoods. On the one hand, indigenous people are forced to enter the forest to collect following fruiting seasons in order not to lose these products. On the other hand, indigenous people are also forced to enter the forest to collect firewood. This interaction shows us that from production to consumption, as well as for saving goods or services, the forest plays an important role in almost all aspects of local people's needs.

The role of NTFPs has been observed for agriculture tools and equipment, for foods and medicines, for house construction, for spiritual purposes and for generating income. NTFPs also make a crucial contribution to agriculture production in their role as a source of fertiliser for rice cultivation, producing poisons or toxins to fight off insects or diseases, as well as being used for fences to keep out animals. The forest's role as a source of NTFP products for agriculture can be divided into two main functions: (1) providing nutrients or organic fertiliser for paddy rice cultivation, and (2) supporting paddy rice maintenance and post harvesting handling. NTFPs are also used in the care and handling of agriculture products such as rice basketry made of rattan. These roles indicate that without NTFPs it would be difficult to obtain sufficient rice production for local people. This means that local people's agriculture activities are strongly affected by the existence and the sustainability of NTFPs.

From the result of interviews with the villagers, it is also clear that non-timber forest products are highly valued by the indigenous people, who see them as more than just goods or products. These products are also imbued with spiritual values and are linked to forest and human relationships. The forest and its ecosystem is also perceived as a place where 'ghosts' or 'souls' of ancestors reside. Paser people believe that the forest is a place and a source of imagination, which connects them with 'God'; a place where they can communicate and pray.

From the production and consumption data of NTFPs in the previous section it can also assumed that rice production is key to agriculture and forestry related activities of the Paser indigenous people. More than half of the labour supplies in the research villages were devoted to rice production. This indicates that people in the research area depend on their own rice production to fulfill their needs. This is the result of two possible conditions in the research area: first, that rice is the main source of food for the indigenous people of Paser; and second, that the accessibility of village studies to market and imported products is very low. Villagers in the research area are forced into self-sufficient rice production with a very limited contribution from other production factors, such as technology, fertilisers and with a very low market influence.

Based on the existing skills and knowledge of the villagers', it can be summarised that agriculture production in the research area relies heavily on the soil contribution of the forest. The implication of this land use system is the increasing number of forest conversions for paddy rice cultivation, following the increased demand due to population growth.

The research also reveals that local people have begun to domesticate several forest plants. This is conducted both purposively and by coincident action. Many forest fruits were eaten at home and the seeds were incidentally thrown away in thet home garden. The subsequent growth enriches the garden's tree composition. At the same time, some forest fruits seedling were taken from the forest and cultivated by farmers in their home gardens or paddy rice fields in the aim of domesticating forest products.

It seems that Paser indigenous people have developed various survival strategies that reflect their nature and isolation. They maintain the balance between their needs and resource capability to supply their demand. This traditional wisdom can be maintained in the future if population growth is? and there is sufficient forest land for cultivation.

Given these findings, it can be concluded that the standard of living of the Paser indigenous people will deteriorate if the government and foresters do not take into account the importance of the forest and its products for this community. Disregarding NTFPs in the policy of forest management will not only result in the depletion of NTFP resources, but also devalu the forest. Ultimately, this will lead to economic, social and environmental problems for these village communities.

Chapter 6

Economic Value of Non-timber Forest Products in the Research Villages

6.1. Introduction

For each of the three villages in this study, the collected data have been used to construct a set of accounts, on the basis of accounting procedures as described in Chapter 3, section 3.11. In these villages, household earnings generated from the exploitation of timber are also included in order to show the total forest output for the household economy and to compare the value between timber and non-timber. However, these figures are largely calculated on the basis of the non-timber values of forest. Through the analysis of both inputs and outputs, a set of accounts for each village can be developed, and the value of forest inputs used by villagers can be derived. This value can serve as an indicator of the use value of the forest for the people who depend upon it for their livelihoods. Each village will be considered separately, and subsequent comparisons will be made between them in Chapter 7. Tables to illustrate various selections of these accounts are provided in the appendices of this book.

6.2. The village of Rantau Layung

The village of Rantau Layung is located on the river bank of Kasunge in the sub-district of Batu Sopang in Pasir District (see map in Chapter 3, Research area) and in the densely dipterocarp lowland forest area of the Gunung Lumut Protection Forest. It is a small village in the hilly forest area and it is situated on a tributary of the Kasunge River. It is approximately 30 km from Batu Kajang, the sub-district of Batu Sopang, and 14 km from the sub-district's market centre of Simpang Pait. It is home to 206 people living in 45 households.

As described in Chapter 4, Rantau Layung village was also the resettlement village of the Paser nomadic people in the area of the Kasunge River. The village was established in the late 1950's to facilitate a resettlement programme for Paser indigenous people.

The name Rantau Layung originates from Paser dialect and means the land along the river with the *Lahung* trees. *Lahung* is a species of fruit tree similar to the durian (*Durio kutejensis* (Hassk)) that is abundant in the forest around this village.

The village has a government primary school (*sekolah dasar*) with three full-time teachers, and it now also has a new office for the village head as part of the government programme. The village stretches over a large area, with some of the houses being as much as 2 km from the school, and some of the farms are even further away.

As in any productive unit, production depends on the inputs of land, labour and the capital, and in this analysis, labour and capital are valued at the market rate. No account is taken of the cost of land rental, since the land used by each household in the research villages is communally owned and so no rent or tax is paid by the farmers. In the following analysis, the value of all of the inputs and outputs of each household will be examined. The tables referred to in this text are shown in Appendix 8.1a.

6.2.1. Household labour input values

The total supply of labour for the village of Rantau Layung has been calculated according to the methodology outlined in Chapter 3, section 3.11 and details of the hours spent in each economic activity, per household, are shown in Appendix 8.1a. This information is summarised in table 6.1 and figure 6.1 below. Using this methodology, it can be seen that the total annual hours of effective labour supply in Rantau Layung in 2005 is 93,780 hours (see also Appendix 8.1a).

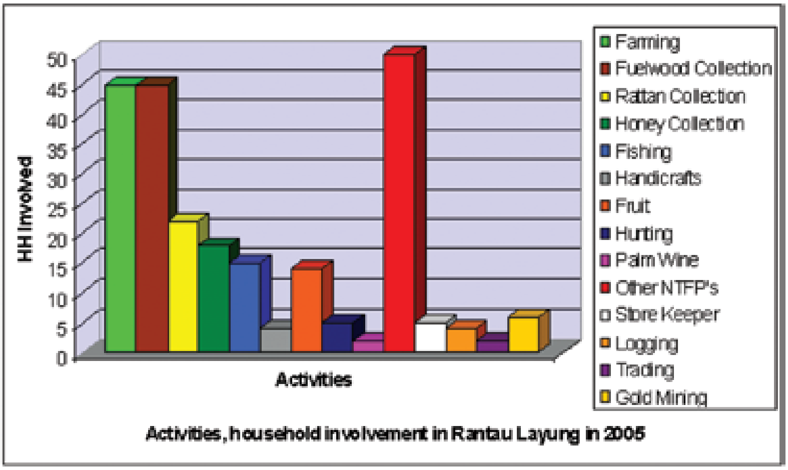


Figure 6. 1. Activities household involvement in Rantau Layung 2005

It is clear from these figures that farming, fuel wood and other NTFPs are by far the most important activities in which these villagers are engaged. Non-timber forest products collection is the next most time consuming activity, followed by the fuel wood and store keeping. Collection of NTFPs is focused on vegetables, foods, mushrooms and medicinal plants, but rattan collection is the most important in terms of time spent, closely followed by wild honey and fruit collection. In total, NTFPs consume 25.75 per cent of the total labour time in the village. This indicates that the collection and processing of NTFPs are the second most important activities undertaken by people in Rantau Layung. The collection of other non-timber forest products only takes a small amount of people's time, but, nevertheless, every household participates to some degree. The materials collected are used for food, medicinal purposes, handicrafts and construction material for houses or village huts.

Table 6.1 below also shows the distribution of household labour in Rantau Layung and it can be calculated the labour values per household are Rp. 5,328,406.25 per annum, with this being the imputed value of the aggregate household labour supply. These values have been estimated by applying a shadow wage of Rp. 3,125 per hour, based on the opportunity cost of labour in logging concessions. Using this shadow wage of Rp. 3,125 per hour, the total annual imputed value of labour for the village is Rp. 293,062,500. This is not to be interpreted as representing the money income of the households; rather, it is an estimate of the accounting value of the labour inputs of households in all of the economic activities in which they participate.

Table 6. 1. Estimated labour time values in Rantau layung in 2005

Activities	Time budget (hour)	Labour values (Rp.)	Share
Farming	46,000	143,750,000	49.05%
Forest (NTFPs):			
• Other NTFPs	11,200	35,000,000	11.94%
• Fuel wood collection	10,400	32,500,000	11.09%
• Rattan collection	5,040	15,750,000	5.37%
• Fishing	3,000	9,375,000	3.20%
• Fruit	1,584	4,950,000	1.68%
• Honey collection	1,200	3,750,000	1.27%
• Handicrafts	864	2,700,000	0.92%
• Palm wine	816	2,550,000	0.87%
• Hunting	428	1,337,500	0.45%
Store keeper	8,000	25,000,000	8.53%
Logging	4,224	13,200,000	4.50%
Trading	128	400,000	0.13%
Gold mining	896	2,800,000	0.96%
Gov. services			
T o t a l	93,780	293,062,000	100%

Notes : One hour work was valued with Rp. 3,125 based on the opportunity cost of labour in logging concession of Rp. 25,000 of an eight hours work a day.

It is important to note that, as in the standard accounting framework, no account is taken of domestic work or child-rearing duties. Nevertheless, this imputed value of labour in Rantau Layung can now be combined with the value of other factor inputs in order to compute the total value of inputs in the calculation of the village product.

6.2.2 Capital input values

The methodology of determining the value of capital stock, and the means of determining the prices used have been outlined in detail in section 3.11 in Chapter 3. The numbers for productive capital stock values per household are used to calculate the capital consumption associated with the village production process.

Capital consumption has a cost associated with it, and this is accounted for in the Gross Village Product calculation as the term δK_p, which represents the change in capital stock through depreciation. For the purpose of this production analysis, the value of capital stock is assumed to have a life span of five years, on the basis of qualitative data from the respondents, giving a straight-line-depreciation rate of 20 per cent per annum. The total value of productive capital in Rantau Layung is Rp. 253,837,000 and with a 20 per cent of depreciation rate, the amount of capital consumed during the year is Rp. 50,767,400 (the total value of capital with the 20 per cent depreciation deducted). By applying the value of depreciation to the equation, the figure calculated becomes the Net Village Product, as opposed to the Gross Village Product.

Table 6. 2. The calculation of the value of productive capital stock in Rantau Layung in Pasir District

Item and amount	*Amount / units*	*Price per-unit (Rp.)*[1]	*Total Capital Value (in Rp.)*
Shovel or spade	*22*	*55,000*	*1,210,000*
Rake	*17*	*25,000*	*425,000*
Hoe	*9*	*65,000*	*585,000*
Manual saw	*8*	*50,000*	*400,000*
Chainsaw	*11*	*8,500,000*	*93,500,000*
TV receiver (parabola)	*4*	*1,350,000*	*5,400,000*
Plastic bag (karung)	*87*	*12,000*	*1,044,000*
Radio, 10	*10*	*125,000*	*1,250,000*
Canoe engine	*12*	*2,450,000*	*29,400,000*
Mandau/long knife	*84*	*60,000*	*5,040,000*
Motorbike	*7*	*14,500,000*	*101,500,000*
Electric engine	*4*	*3,250,000*	*13,000*
Oil /petrol, ltr	*1200*	*7,000*	*8,400,000*
Water tank (600 litres)	*2*	*850,000*	*1,700,000*
Axe	*24*	*125,000*	*3,000,000*
Plastic nylon covers	*6*	*45,000*	*270,000*
Water cup (15 litres)	*28*	*25,000*	*700,000*
Total capital value			*253,837,000*

[1]Price per-unit is based on the village level in 2005, and unit number is based on household interview in July to September 2005.

The holding of capital also has a cost in terms of foregone interest, and so the village cost opportunity of holding capital is *rK*, where r is the real rate of interest for the relevant period and *K* is the value of village household capital. In Pasir District, the real rate of interest is in fact a positive rate of 5 per cent, since the rate of inflation is 7 per cent (BPS Kaltim 2006), while the Regional Bank of Indonesia lending rate in September 2005 was 12 per cent. Such a positive rate is appropriate as an indicator of the true opportunity cost of capital use in this situation, and so a rate of return of 12 per cent will be employed in the calculation of the Net Village Product for Rantau Layung and the other villages. This is thought to be representative of the more usual rate of return on capital and, on this basis, the opportunity cost of the capital used in production in Rantau Layung reaches a total of Rp. 30,460,440 per annum.

6.2.3. Estimating household output values

All household outputs from different activities need to be taken into account. These are the values of outputs from all of the productive activities of the households, and these include farming, fishing, fuel wood collection, hunting, palm wine, rattan, honey, other NTFPs, storekeeping, trading and production of handicrafts.

6.2.3.1. The assessment of farm outputs

The main costs include labour (mainly family labour) for land selection, slash and burn, felling and cutting trees, burning the cut vegetation, land preparation (racking/clearing soil), planting, weeding, guarding the crops (against animal pests), harvesting and carrying the crops home. Along with rice, farmers typically plant field crops such as vegetables, cassava, banana, ground nut and maize, which are harvested two years after planting over a period of about three months. This system relies on rainfall and available soil fertility. Farmers do not employ irrigation or fertilisation. The mean rice yield per hectare is 109.6 *kaleng* (cans), equal to 1,315.2 kg. This yield is consistent with that recorded by other researchers like Colfer (1998), Haury and Saragih (1996) and Belcher et al. (2003) in nearby areas.

Assessment of the farm outputs in Rantau Layung has produced a product profile typical of subsistence farming in tropical rainforests. The wide range of crops farmed by most households reflects the varied nature of a farm of Paser people, where a large number of crops are planted together in a relatively haphazard way. This great variety of crops provides a degree of food security for households, as total crop failure is extremely unlikely to occur. On average, over 45 crops may be planted, in addition to rice, and a system of agroforestry is used by all farms.

Because of the extreme poverty of these households, little livestock is kept, and the only animals in the villages are dogs used by men when they go hunting, and a small number of buffalo trained for timber extraction. Domesticated pigs are not found here as the households are Muslim. They do not have the capital to invest in other domestic animals. A small number of chickens are kept by a few households, and the eggs collected from them are included as farm output.

The volume of crop output by household is calculated, as explained in the previous chapter, from data collected from farmers, male heads of households and senior female members of the households. The monetary value of this output can be calculated from the prices for crops in the village itself, or in the local market. These prices were calculated from farm surveys, where farmers reported crop prices, plus observations at the nearest market of many occasions during the study period. The average of these prices is used in the calculation of farm output values. By multiplying the household output of each crop by its price, it is possible to estimate the monetary value of farm output. By summing across all households, the value of village farm output is calculated, and this is shown in table 6.3 on page 114 (see also Appendix 8.2a). From this table, it can be seen that the average value of farming is Rp. 1,967,055 per household, while the total value for the village as a whole is Rp 88,540,000 or 20.32 per cent of the total village output. As farming represents one of the major sectors of the village economy, this figure is an important part of the calculation of the Net Village Product.

6.2.3.2. Hunting and trapping

Traditionally, 'bush-meat' has provided the main source of protein for these households, and villagers do not keep domestic animals of any sort as a source of food. In this village, the majority of hunters consider deer (of the six main wild animals) as the most valuable animal to hunt since they are relatively easy to catch. This fact highlights the importance of the forest for communities such as these, and the contribution it makes to both food security and community health. In addition, it is clear that the value of hunting revenues should be included in the assessment of Net Village Products (NVP). Estimates of the value of hunting catches are shown in table 6.3 and Appendix 8.2a. These values are based on the estimated numbers of animals caught by hunters, and the market price for those animals, as reported by hunters and observed in the nearest market.

Several households in Rantau Layung do not participate in hunting or trapping activities for various reasons, not least of which is the difficulty of ensuring success. The relatively high return of hunting suggested by the figures in table 3 reflects the skills required to be successful as hunter, and the steady demand for the meat. Those households that are not involved in hunting obtain meat by barter or receive it as a gift from a family member, friend or neighbour. This is a type of informal inter-household credit market, which serves an important social welfare role in the community.

The value of hunting and trapping in Rantau Layung comes to a total 1.09 per cent of the total village output. Taken across all households in the village, hunting contributes an average value of Rp.4,749,000 per annum, which is clearly a significant amount. This highlights once again the importance of the forest for the well-being of these forest dwellers, and it is important to note that any programme to improve the standard of living of these villagers is also likely to have an indirect benefit to the forest ecosystem, as it is likely to lead to a decrease in the consumption of wild animals as a source of food. On the other hand, if the standard of living of the habitants of villages such as this fails to improve, it is likely that there will be an increasingly unsustainable demand for deer and other animals from the forest, once again putting pressure on the integrity of the forest ecosystem itself. The impact of poverty on the ecosystem was already well documented by WCED in 1997, and if the diversity of the Gunung Lumut Forest area is to be maintained, the improvements must be made to the standard of living of the people living within them (Saragih, 2006)

6.2.3.3. Fishing output

It is well known that deforestation can have a dramatic effect on the watersheds of the river courses and, to some extent, the availability of clean rivers with fish reflects the fact that the forest ecosystem is functioning well. An assessment of the value of fish is therefore another indicator of the value of those ecosystem services to local inhabitants, and of course it also must be included as part of the Net Village Product.

The field survey in 2005 revealed that fishermen recognised 26 species of fish found in their river, but only five of these species are consumed because some fish are poisonous and others are very small, which makes them difficult to catch.

The most popular method of fishing in this village is with a net, with over 55 per cent of the fishermen considering this the most effective method. The traditional method of catching fish is to use poison made from forest plants. This remains an important practice, with 30 per cent of fishermen believing it o be the most effective method. The use of forest plants such as *Bauhinia* and *Byrsonima crassifolia* once again highlights why the forest is considered important to households such as these, since these plants contribute significantly to fish catches. This also applies to the various traps used, as these are also made from forest plants like *bubu* or traps made of rattan and bamboo.

A wide variety of fish is caught in Rantau Layung waters. It is clear that these and other species all provide important protein to the household diet, and their value should be included in the calculation of the output values of the NVP. Details of the value of fish catches in Rantau Layung are given in table 6.4 and it can be seen that the value of the fishing catches per household in Rantau Layung was Rp. 7,792,000 or 1.78 per cent of the total village outputs in 2005.

6.2.3.4. Rattan harvesting

Harvesting of rattan canes is the most prominent NTFP collection activity for generating cash for the 45 households observed in Rantau Layung. The average monthly earnings per collecting household is Rp. 41,703. Table 6.3 and Appendix 8.2a give details of harvesting figures, and the estimated value of Rp. 22,520,000 for the annual value of rattan harvesting in Rantau Layung represents another sector in the village economy. For the village of Rantau Layung rattan representS the most important source of cash income to the villagers, which must be included in the calculation of NVP.

6.2.3.5. Wild honey collection

Using the same method described for the calculation of rattan, the value of wild honey collected in Rantau Layung can be estimated. Harvesting of wild honey or *wani,* a local term for the *apis dorsata* nests hanging in the branches of *Koompalsia malacensis* or *Koompassia excelsa* trees, is an important activity for the people in this village. Table 6.3 provides details of harvesting figures, and the estimated value of Rp10,495,000 per annum. The value of honey collection in Rantau Layung represents another important sector of forest products for the village economy. For the village of Rantau Layung, honey collection represents 2.40 per cent of the total annual income and this is an important source of cash income to the villagers and this must also be included in the net village calculation.

6.2.3.6. Forest food and fruit collection

Details of the types of food and fruit gathered from the forest have been given in the previous chapter and in Appendices 5 and 6. It is shown that for the households involved in this activity, in addition to rattan and honey collection, the food and fruits coming from the forest are mainly for home consumption. However, they make an important contribution to the household diet and thus they need to be included. On average, 14 of the 45 households observed in Rantau Layung regularly collect food plants from the forest. In addition, villagers, especially children, consume forest foods and fruits informally whenever they are in the forest. Although no account is taken of this informal individual forest food consumption, an attempt is made here to include the value of regularly selected forest foods, using the methodology outlined in the previous chapter. The monetary value of these forest foods can be calculated on a household basis and then summed across all households to give the total value of forest food and fruits for the village total value. Table 6.3 (on page 114) conservatively estimates this figure to be Rp. 13,853,000 and this again will be included as part of the Net Village Product. Species list of plants used for fruits and food are also given in Appendices 4 and 5.3.

6.2.3.7 Palm sugar

Harvesting of wild *enau* or *Arenga pinnata* for making *gula aren* or red sugar is an important activity for some households in Rantau Layung. With average monthly earnings per collecting household of Rp. 189,583, the estimated value of Rp. 4,550,000 per annum for palm wine harvesting in Rantau Layung represents 1.04 per cent of the total annual income. This forest plant contributes to the villager's economy and is an important source of cash income; therefore, it must be included in the calculation of the Net Village Product.

6.2.3.8 Handicrafts value

As can be seen from table 6.3, only four households or six people in this village actually consider handicrafts as an activity in which they regularly participate. In other households, some small items may be made when necessary, but these are not included in this calculation as their value cannot realistically be estimated. This suggests that the value of handicraft output tends to be underestimated, rather than overestimated. The low village value of Rp 2,008,000 accounted for by handicraft reflects the small number of households that consider handicrafts to be a source of income.

Basketry, hammock-making and weaving are the most frequent craft activities in Rantau Layung, and the materials used, as well as the products price at village level, are shown in Appendix 10.

This indicates once again the importance of non-timber forest products to village households, since they provide the materials for essential household items, which are made using traditional craft techniques. One of the reasons why few households earn an income from handicraft work in this village is the problem of transportation to the nearest market. Taking goods to a very uncertain market involves a seven-hour round-trip paddling in a canoe. It seems likely that this reduces the incentive to get involved in this type of work. Nevertheless, this handicraft value is part of the village output.

6.2.3.9 Fuel wood consumption

The collection of fuel wood is a very important household activity in all villages of this type, since it provides the main source of energy for cooking. Performing the duty of collecting fuel wood varies from house to house, with some households relying on child labour, while in others it is an activity in which all family members participate. The methodology used to value the use of fuel wood has been explained in the previous chapter and, from table 6.3, it can be seen that the total estimated value of fuel wood, to be included in the NVP of Rantau Layung, is Rp. 15,222,000 or 3.49 per cent of the total annual output values for Rantau Layung villagers. The list of plants used as fuel wood is shown in Appendix 5.2.

6.2.3.10 Other output values

Using the same method described for the calculation of forest foods and fruits, the value of other NTFP plants used in Rantau Layung can be estimated. A variety of plants is used by households, who all collect different plants on different occasions for various purposes, such as for medicines, condiments or for spiritual ceremonies. Determining a market price for these plants is not easy, as they are not sold within the villages. Only some of these products are sold in Simpang Pait, the nearest market to Rantau Layung, but the market price here is not truly representative of their value because of other factors, such as transport costs. To overcome this problem, the price of *gaharu* (eaglewood) and *pasak bumi* (*Eurycoma longifolia*) is used as a proxy for all plants. On this basis, the total annual value of medicinal plants can be calculated. A breakdown of this is shown in table 3 and the final total is undoubtedly a conservative estimate. Indeed, this figure is likely to be much higher if a substitute pricing method, based on malaria treatment, is used. Since these medicinal plants represent another household output, this estimated value is included in the value of total NVP.

Some of the villagers are involved in government jobs, such as teaching, village administration and rural development agencies and they are paid by local government on a monthly basis. Many villagers are also involved in storekeeping, logging and trade. The annual total value of these other income sources is Rp. 265,900,000. This represents 61 per cent of the total annual income in 2005.

6.2.4 The total value of net village output

Referring back to the previous chapter, which outlined the calculation of Net Village Product (NVP), the equation (2) explains how the NVP is calculated:

$$NVP = \sum_{h=1}^{H}(wL^h + rK^h + \delta Kh + p_f F^h) = \sum_{h=1}^{H} \sum_{i=1}^{n} piQi^h \qquad (2)$$

6.2.4.1 Village inputs

The computation of all productive inputs, ($wL^h + rK^h + \delta K^h + pfF^h$) is shown in detail in the attached appendix, and table 3 summarises these, showing the value of the labour and capital use, as well as depreciation, along with the computation of pfF^h (value of forest use).

6.2.4.2 Village outputs

Table 6.3 provides a summary of all the values of all of the household outputs,

$$\sum_{i=1}^{n} i=1\ piQi^h$$

This table indicates that some households are notably more productive than others, with some variation between households occurring in the relative sizes of the various sectors. This is not surprising, and is certainly worthy of further investigation. In addition, a deeper understanding of the links within and between households is revealed by the qualitative data to be analysed at a later stage.

The total value of outputs of all economically productive activities in Rantau Layung is Rp. 435,632,000. This gives an average per household value of Rp.9,680,000. This figure is inserted in the formula for the estimation of the derived value of forest inputs.

6.2.4.3 The derivation of the use-value of forest inputs in Rantau Layung

To compute this value, we need to sum across all households for all outputs and inputs, and the values of the forest residual $p_f F^h$ will be determined by re-arrangement of the known values, using the formula:

$$\sum_{h=i}^{H} p_f F^h = \sum_{h=1}^{H} \left(\sum_{t=1}^{n} p_t Q_t^h - (wl^h + rk^h + \delta K^h) \right) \tag{3}$$

The forest residual ($p_f F^h$) represents the contribution made to the production process by land, i.e. the rent. It can also be described as the 'value added from nature', or the value of the forest resource to the Paser people of the village of Rantau Layung.

In this particular case, for Rantau Layung in 2005, the total of this value added forestry is Rp. 328,802,000, Rp. 230,752,000 of which represents the value generated by the anthropogenic use of non-timber products from the forest. It is important to note here that no amount has been included for the value of timber products, as these are not part of non-timber products. Therefore, the value of total village output including the value of timber is Rp 435,632,000. This amount can be estimated because the number of trees used for timber (not only for subsistence construction, but also for the market) is relatively small as the government will confiscate the timber it believes to be derived from illegal logging.

The population of Rantau Layung consists of 206 men, women and children and, on the basis of the above estimate of total value of rent, or value added obtained from the forest, the per capita value is Rp 2,114,718 per year. Using this per capita figure, it is possible that for the average household of 4.57 people in Rantau Layung, the value of the contribution derived from the forest to household income per year would be Rp. 1,596,126, Rp. 1,120,155 of which comes from NTFPs. The relatively significant amount of income accrued from the forest could have important implications for the people in the village, and in other similar villages nearby.

Another way to look at the relative importance of the various productive inputs, is to examine their relationship with the level of outputs. In this village, the total value of capital use, in the form of foregone interest and capital depreciation, is Rp. 50,767,400 (see section 2.2 above), while the total value of outputs in the village is Rp. 435,632,000 (see table 6.3 below). This illustrates that the capital and output ratio of this rural subsistence production system are low, with slightly less than 11.65 per cent of output being the result of capital input. These figures also show that the production system in this village is very labour intensive, with 67.27 per cent of output resulting from the efforts of labour. It is interesting to see that the contribution of the forest as a productive input is significantly more important in this village than the contribution of capital, since the ratio of forest inputs to the total output indicates that 75.47 per cent of output (in the form of the use of timber and non-timber forest products and services), results from the input of nature. This suggests that any removal of the option to use such inputs would have a very significant effect on the well-being of these households.

Table 6. 3. Summary of activities and village output values in Rantau Layung in 2005 (Rupiah)

Activities	Households Involved	Total Output	Output per household involved	Output per household	Share
Farm	45	88,540,000	1,967,555	1,967,555	20.32%
NTFPs:					
• Other NTFPs	45	48,190,000	1,070	1,070.8	11.06%
• Rattan	22	22,520,000	1,023,636	500,444.4	5.16%
• Fuelwood	45	15,222,000	338,266	338,266.6	3.49%
• Fruits and foods	14	13,853,000	989,500	307,844.4	3.17%
• Wild honey	18	10,495,000	583,055	233,222.2	2.40%
• Fishing	15	7,792,000	519,466	173,155.5	1.78%
• Hunting	5	4,749,000	949,800	105,533.3	1.09%
• Palm wine	2	4,550,000	2,275,000	101,111.11	1.04%
• Handicrafts	4	2,008,000	502,000	44,622.2	0.46%
Others:					
• Logging	4	98,050,000	24,512	2,178,888.8	22.51%
• G.Services	8	72,000,000	3,415,000	1.,600,000.0	16.52%
• Store	5	27,320,000	5,464,000	607,111.1	6.27%
• Mining	6	2,990,000	498,333	66,444.4	0.68%
• Trade	2	1,830,000	915,000	40,666.6	0.42%
Total	45	435,632,000		9,680,711	100

Source of data: Summary of field survey in 2005.

6.3. The village of Pinang Jatus

The name Pinang Jatus is derived from the words *Pinang* and *Jatus*. *Pinang* is a kind of palm (*Areca catechu*) and an important plant used as a condiment and for spiritual purposes. It is commonly used in food such as spadix. The term *jatus* means one hundred or *seratus* (Ind.). There is a story that the village was named Pinang Jatus because, long ago, an unmarried woman was forced to plant one hundred *pinang* (*Areca catechu*) seedlings by the villagers as a punishment for her stealing the *pinang* belonging to her neighbour (*Kepala Adat* in press.comm., 2004).

Pinang Jatus village consists of 56 households and 265 inhabitants. The average household size is 4.73 people, with a total of 127 men in the village and 138 women. On average, these households cultivate 2.2 ha of land, which is divided into rattan gardens, rice fields, and field for cultivating other cash crops such as cassava, palm oil and coffee.

Houses in the village are spread out along the road. While some are located in close proximity to each other, there are some houses within the village that can be as much as two miles apart. A mosque has recently been built in the village, funded by small-scale logging in Pinang Jatus. A church was built five years ago, but some older villagers still follow their own religion, a variety of Hinduism known locally as *Kaharingan*. The village has a small school with four rooms and three full-time teachers. It is poorly equipped and sparsely furnished. There is no healthcare centre (*puskesmas*) in Pinang Jatus.

The distance from the village to the centre of the sub-district is 24 km and it is 65 km to the district capital of Tanah Grogot. This village is located in the northern part of the Gunung Lumut Protection Forest. Like the other villages in the Gunung Lumut area, the economic situation of Pinang Jatus is poor due to very few development activities, poor transportation facilities and low accessibility to the market.

The people of Pinang Jatus work mainly for subsistence and undertake shifting cultivation and the collection of forest products, timber and non-timber products such as hunting wild animals, collecting forest plants, and making handicrafts from forest palm products like rattan and bamboo. The most prominent NTFPs harvested by the people of Pinang Jatus are honey, rattan, fuel wood, forest fruits, and wildlife. The figures of these collections are shown in Chapter 5. This section is aimed at evaluating the monetary value of these products.

The arrival of three logging companies in a village nearby (PT. Telake Mandiri Sejahtera, PT. Mentari and PT. Basuimex) during the last decade has increased the accessibility and the mobility of the people of Pinang Jatus, as they shift from using the river to the road. This change of transportation system has had a considerable impact on the life of Pinang Jatus people. When the river was the only mode of transport, the regular market was hard to reach. It took one or even two weeks to make the trip to the market and return home again. Today, the market can be visited daily if necessary, at relatively low cost. Access to the market has enabled the people in Pinang Jatus to get more involved in the cash economy. At the same time, this implies a need to generate more cash in order to be able to buy the industrial goods available in the market, which are perceived more attractive than traditional NTFP products.

6.3.1 Household labour input values

The household labour costs for this village are calculated on the basis of the effective working hours of men, women and children. The distribution of this labour between various household economic activities is shown in Appendix 8.1b and summarised in Table 6.4 below. This table indicates that the total time spent by villagers in economic activities is 122,494 hours per annum, with 48.35 per cent spent on farming, 2.51 per cent spent on handicraft work, 14.12 per cent on fuel wood collection, 8.63 per cent on fishing, and 8.82 per cent on rattan collection. 44.26 per cent of the total labour time is spent collecting non-timber forest products, something that almost all households participate in.

Table 6.4 shows the average labour time spent on each activity by participating households only; it is not the average across the village as a whole. This indicates that there is some variation in how families organise themselves, although almost all are involved to some extent in farming, fuel wood collection and collection of non-timber forest products. None of the households participate in all activities, but all are involved in six to ten of the 14 activities in the village. In other words, each household undertakes at least six activities in order to fulfill their household subsistence needs, as well as for income generating activities.

The total estimated annual value of labour inputs in Pinang Jatus is calculated by applying the previously explained shadow labour value. This is taken to be employment in a logging concession at Rp. 3,125 per hour. The value of labour estimated in this way is shown in Table 6.4 below and, from this, it can be seen that, on average, households invest labour worth Rp. 6,835,602 per annum, with the total value of village labour in Pinang Jatus in 2005 being Rp. 382,793,750.

Table 6. 4. The summary of households' labour time and estimated values in Pinang Jatus in 2005.

Activities	Labour time (hours)	Labour values (Rp.)[1]	Share
Farming	59.232	185,100,100	48.35%
Forest (NTFPs):			
• Fuel wood collection	17.297	54,053,125	14.12%
• Rattan collection	10,800	33,750,000	8.82%
• Honey collection	987	3,084,375	0.80%
• Fishing	10,576	33,050,000	8.63%
• Handicrafts	3,080	9,625,000	2.51%
• Food and Fruits	2,125	6,640,625	1.73%
• Hunting	1,164	3,637,500	0.95%
• Palm wine	1,028	3,212,500	0.84%
• Other NTFPs	4,182	13,068,750	3.41%
Store keeper	2,393	7,478,125	1.95%
Logging	6,400	20,000,000	5.22%
Trading	800	2,500,000	0.65%
Government services	2,430	7,593,750	1.98%
T o t a l	122,494	382,793,750	100

1) the labour value is estimated by multiplying the labour time of an activity with the opportunity cost of labour in a logging concession at Rp.3,125 per hour.

6.3.2 Capital input values

The method of calculating household capital has already been described in the previous chapter. Using this method, the value of productive capital items has been calculated and is shown in table 6.5 below. The value of the use of capital is again calculated on the basis of an imputed interest rate of 12 per cent, while capital depreciation is at 20 per cent. The total value of productive capital used in the village in 2005 is Rp.4.363.392 per household. The total cost of holding capital in Pinang Jatus (the imputed foregone interest) is Rp. 29,322,000 while capital depreciation at 20 per cent comes to Rp. 48,870,000. Once again, these figures indicate that the production process in the village is very labour intensive, with the capital to labour ratio being only 0.837.

Table 6. 5. The value of productive capital stock in the village of Pinang Jatus.

Item and amount	No. of units	Price per-unit (Rp.)	Total Capital Value (in Rp.)
Shovel or spade	33	55,000	1,210,000
Rake	42	25,000	4,250,000
Hoe	22	65,000	27,300,000
Manual saw	8	50,000	400,000
Chain saw	6	8,500,000	51,000,000
TV receiver (parabola)	6	1,350,000	8,100,000
Plastic bag (karung)	126	12,000	1,512,000
Radio	10	125,000	1,250,000
Canoe engine	7	2,450,000	17,150,000
Mandau/long knife	102	60,000	6,120,000
Motorbike	6	14,500,000	87,000,000
Electric engine	2	3,250,000	6,500,000
Oil /petrol (3200 litres)	3200	7,000	22,400,000
Water tank (600 litres)	6	850,000	5,100,000
Axe	56	125,000	7,000,000
Plastic nylon covers	9	45,000	4,050,000
Water cup (15 litres)/	67	25,000	1,675,000
Total capital value			244,350,000

Notes: Price per-unit is based on the village level in 2005, and unit number is based on household interviews in July to September 2005.

6.3.2.1 Farm output values

As with the other villages, survey data on farm outputs was collected from a number of sources for all households in the village, with the exception of a few that were temporarily unoccupied during the fieldwork period. These data provided details of which crops were produced, and estimates on how much of each crop was produced annually were made both by farmers and senior male or female household members. Where possible, the farming data were collected from someone other than the senior male household member, thus enabling some cross-checking, and facilitating the development of a comprehensive account of farm outputs.

The value of these crop outputs is calculated on the basis of the average market prices for each crop, as given by the farmers in the village. These prices were also verified as reliable by market observations in the nearest local market at Simpang Pait at Long Ikis sub-district. For those households in which people were temporarily absent, weighted averages were calculated for the total value of crop output, based on the size of the farm used, and the amount of household labour devoted to farming.

Estimates of the total value of all crops produced in the village of Pinang Jatus during 2005 are shown in Table 6.6 and more details are given in Appendix 8.2b. From these figures it can be seen that the total value of farm outputs of the village in 2005 is Rp.109,560,000, which taken per household gives an average farm output of Rp.1,956,428 per annum.

6.3.2.2. Hunting output values

Seven households in Pinang Jatus regularly participate in hunting and trapping, spending an average of six hours per week in that activity during seven months of hunting periods in one year. A few wild animals are caught, but most households hunt for meat, or trap animals for the wildlife trade. In this village, deer are significantly more important to hunters and trappers than birds are. This highlights the importance of this wildlife trade in deer meat, which is organised by traders for the distribution to the nearest market consumers in Balikpapan and Samarinda. In Simpang Pait, the nearest market to Pinang Jatus, wildlife traders from Balikpapan or Samarinda are to be seen on every market day purchasing parrots, deer and other animals at very low prices.

In Pinang Jatus, several households do not participate in hunting or trapping activities for various reasons, not least because of the difficulty of ensuring success. Table 6 suggests that the relatively high returns from hunting reflects the skills required to be successful as a hunter, as well as the steady demand for meat. Efforts to obtain meat by buying or exchanging it for something else are often noted in those families not involved in hunting. They may also receive meat as a gift from family members, friends or neighbours. This kind of distribution functions as a type of informal inter-household market, which also serves as an important social welfare role in the community.

The provision of meat for protein is important to the household diet, and in addition to chicken and fish, the main animals frequently caught for food are wild deer and wild pigs. The methodology of how the hunting and trapping values are calculated has been previously explained. The estimated value of the total hunting and trapping catches in Pinang Jatus in 2005 is shown in Appendix 8.2b. It is clear that the revenue from hunting contributes only 2.38 per cent of the total village output. Although the amount of catches used directly by the household varies, on average, 15 per cent is used at home, while 85 per cent is sold or exchanged. Of those households that hunt regularly, two households go hunting twice a week or more, four households go once a week, and one household goes twice a month or less. Most hunters (four households) spend one day or less per hunting trip, while two go for one to two days, and one household spends one week or more on each hunting trip.

Taking only those households that participate regularly in hunting and trapping, the average catches per year is worth Rp. 230,821 per household. This figure represents an important part of the use value of the forest itself, since the availability of animals and birds for hunting is clearly dependent on the health of the whole forest ecosystem. The total imputed value of hunting and trapping in Pinang Jatus in 2005 is estimated at Rp.12,926,000. This equates to Rp. 1,846,670 per participating household and this figure is included as an output value in the calculation of the Net Village Product.

6.3.2.3 Fishing output values

Eighteeen households in Pinang Jatus regularly participate in fishing. This is a relatively high figure given that this village is visited daily by a market agent selling industrial goods. He buys fresh fish in return. In many cases, the fishermen in Pinang Jatus travel a long way to their fishing sites, even as far as the river in the hinterland, which can take four to seven hours paddling. Table 3.3 provides details of annual fishing catches in Pinang Jatus and, from this, it can be seen that the total value of catches in the village is Rp. 27,500,000.

The contribution of fishing to Pinang Jatus households is especially important, since fish provides a regular source of protein to the diet, and an average of Rp. 1,527,000 is earned per year, per participating household. As with hunting, fishing values are an indicator of the value of the forest, since the availability of river fish is highly dependent on the ecosystem integrity of the forest itself. It is well-known that deforestation can have a dramatic effect on the watersheds of the river courses and, as a consequence, the availability of clean rivers with fish reflects, to some extent, the efficient functioning of forest ecosystem services. Therefore, an assessment of the value of the fish is another indicator of the value of those ecosystem services to local inhabitants.

6.3.2.4 Rattan harvesting values

Just as in Rantau Layung, the villagers in Pinang Jatus the collection of rattan canes is a main source of cash income. Twenty-five households were observed to be involved in rattan collection in 2005. By employing the same methods that have been described for Rantau Layung in the previous section, the average household value of rattan collection in Pinang Jatus is Rp. 1,464,000 per annum, and it generates a monthly income of Rp. 122,000 for each household involved. The total value of rattan harvesting in Pinang Jatus in 2005 was Rp. 36,600,000 or 6.74 per cent of the total village output. This value represents another sector in the village economy. For the village of Pinang Jatus, rattan harvesting represents the most important source of cash income from NTFPs, which must be included in the calculation of NVP.

6.3.2.5 Honey bee collection values

Using the same method described for the calculation of rattan, an estimate of the value of wild honey collected in Pinang Jatus can be made. Harvesting of wild honey or *wani,* a local term for the *apis dorsata* nests found hanging in branches of *Koompassia malacensis* or *Koompassia excelsa* trees is also an important activity for the people in Pinang Jatus. Table l7 and Appendix 8.2b provide details of harvesting figures and show that 18 households were involved in wild honey harvesting and the average harvesting value per household participating is Rp. 480,000. The total estimated value of honey in 2005 was Rp. 8,640,000. This figure demonstrates another important sector of forest as the wild honeybees existence is heavily dependent on the forest ecosystem and the trees providing foods for the bees. Wild honey collection is an important source of cash income fo the villagers.

6.3.2.6 Forest food and fruit collection values

In Chapter five, it was shown that a number of species of plants are used by the people in the research area for food and vegetables. Indeed, it can be seen that 82 per cent of all forest plants collected are used for food and vegetables. Most of the food collected from the forest is in the form of seeds, leaves, shoots, stems, roots and palm hearts. Seasonal variation does occur in the availability of specific forest foods, but generally villagers felt that certain kinds of forest foods are available year round, at fairly similar levels of harvesting efforts.

Thirty-seven out of 56 (67 per cent) Pinang Jatus households collect food and vegetables from the forest on a regular basis. The procedure for calculating the values of forest food and vegetables are the same as those used (and previously outlined) for Rantau Layung. The estimated value of this collected forest food and vegetables is shown in tables 5.2 and 6.2 and in Appendix 8.2b. The monetary value of these forest foods can be calculated on a household basis, and then summed across all households to give the total value of forest food and vegetables for all the villages. Table 6, below, conservatively estimates afigure of Rp. 23,125,000 or Rp. 625,486 per household, per annum, and this is included as part of the Net Village Product.

Details of the types of food and fruit gathered from the forest are shown in table 6.6 and it is clear that in addition to the collection of rattan and honey, the food and vegetables coming from the forest are mainly for home consumption and that they make an important contribution to the household diet.

6.3.2.7 Palm sugar values

The harvesting of wild *enau* or *Arenga pinnata* for making *gula aren* or red sugar is another important activity for some households in Pinang Jatus. Five households in particular are involved in making palm sugar and *gula merah* or red sugar, and the collection of palm leaves for roof material and handicrafts material (*sapu* and *ijuk*). This activity is conducted on a monthly basis and follows the palm fruit seasons.

The calculation of the value of palm wine, roofing materials and leaves from the palm trees are based on the prices in the nearest market at Simpang Pait. Taking into account the five households in the village involved in this activity, the total amount of this source is Rp. 900,000 per household per year, and the total imputed value is Rp. 4,500,000 per year for the whole village.

6.3.2.8 Handicrafts values

As demonstrated in Rantau Layung, handicrafts are very important to every Paser household as the means of processing rattan canes for agriculture and household equipment. In addition, all households use baskets, fish traps, rattan mats (*lampit*), and other crafts items in their daily lives, and all of these are made from various forest plants. In most households, some craftwork is done only when it is needed, but in others, there are people who specialise in handicraft production. Overall, a total of 14 households in Pinang Jatus spend some time making handicrafts, almost exclusively producing items that are useful to the household, and for which there is a steady demand. The earnings resulting from handicraft work in the village are shown in table 6.6 and Appendices 6.2 and 8.2b. From this it can be seen that the total value of handicrafts per household is Rp. 600,000 per annum and the total output of this activity is Rp.10,200,000 per annum.

This indicates once again the importance of non-timber forest products to village households, since they provide the materials for essential household items, which are made using traditional craft techniques. Reasons for the large number of households in this village that are able to earn an income from their handicraft work include the presence of a logging company, the development of palm oil plantations and the availability of transportation to the nearest market.

6.3.2.9 Fuel wood consumption values

As in most subsistence villages, fuel wood is the main source of energy used for cooking, and the average number of hours spent by Pinang Jatus households in fuel wood collection is six hours per week, or two hours per trip, and the average household time allocated for fuel wood collection is 300 hours per annum. The duty of collecting fuel wood varies from house to house, with some households relying on child labour, while in others it is an activity that all family members participate in. The methodology used to value the use of fuel wood has been explained in the previous chapter, and from table 6.6 below, it can be seen that the total estimated value of fuel wood, to be included in the NVP of Rantau Layung, is Rp. 25,000,000.

6.3.2.10 Other output values

Besides the use of prominent NTFPs, as mentioned above, there are also many other NTFPs used by villagers, some of which are sold to the nearest market. By using the same method described for the calculation of forest foods, the value of other NTFP plants used in Pintang Jatus can be estimated. Villagers use plants for medicines, but also for spiritual purposes and some households collect different plants for varying purposes. Determining a market price for these products is not easy, as they are not always sold within the villages. In Simpang Pait, the nearest market to Pintang Jatus, ,only some of these products are sold but the market price here is not truly representative of their value because of a number of other factors such as transport costs. To overcome this problem, the price of the main products being traded, such as leaves, seeds, roots, *gaharu* (eaglewood), and *pasak bumi* (*Eurycoma longifolia*), is used as a proxy for all plants. On this basis, the total annual value of medicinal plants is calculated. A breakdown of this is shown in table 6.6, and the final total is undoubtedly a conservative estimate. Indeed, it is likely to be much higher if a substitute pricing method, based on malaria treatment, is used. Since these medicinal plants represent another household output, this estimated value is to be included in the value of total NVP.

Another income source that is important to mention here is the wage labour or employment for the government. Teachers and officers of the village administration or rural development agencies are paid by local government on a monthly basis.

The last activity that must be mentioned is another type of off-farm labour, which includes storekeeping, working for logging companies, or timber cutting and trading. The average household income from these sectors is Rp. 5,064,000 per annum and the annual total value of these other sources of income comes to Rp. 283,599,000. This represents 41.64 per cent of the total annual income in 2005.

Table 6. 6. Summary of activities and village output values in Pinang Jatus in 2005 (in Rupiah).

Activities	Householdss Involved	Total Output	Output per household involved	Output per household	Share
1. Farm	56	109,560,000	1,956,400	1,956,400	20.19%
2. NTFPs:					
• Rattan	25	36,600,000	1,464,000	648,214	6.74%
• Other NTFPs	56	36,000,000	642,850	642,857	6.63%
• Fishing	18	27,500,000	1,527,000	491,071	5.06%
• Fuel wood	56	25,000,000	446,000	446,428	4.61%
• Forest foods	37	23,125,000	625,000	412,946	4.26%
• Hunting	7	12,926,000	1,846,670	230,821	2.38%
• Handicrafts	14	10,200,000	600,000	82,142	1.87%
• Wild honey	18	8,640,000	480,000	154,285	1.59%
• Palm wine	5	4,500,000	900,000	80,357	0.82%
3. Others:					
• Logging	15	168,000,000	16,000,000	2,000,000	32.08%
• Govt. services	8	46,000,000	5,750,000	821,428	8.47%
• Trading	6	12,000,000	2,000,000	214,285	2.21%
• Store keeper	5	3,590,000	718,000	64,107	0.60%
Total	56	523,641,000	1,496,940	9,350,732	100%

6.3.3 The total value of net village output

Referring back to the previous chapter, equation (2) explains how the NVP is calculated:

$$NVP = \sum_{h=1}^{H} (wL^h \quad rK^h + \delta K^h + p_f F^h) = \sum_{h=1}^{H} \sum_{i=1}^{n} piQi^h \qquad (1)$$

6.3.3.1 Village input values

The computation of all productive inputs, ($wL^h + rK^h + \delta K^h + pfF^h$) are shown in detail in the attached appendix, and table 3.2 summarises these, showing the value of the labour and capital use, as well as depreciation, along with the computation of pfF^h (value of forest use).

6.3.3.2 Village output values

Table 6.6 above provides a summary of all the values of all of the household outputs,

$$NVP = \sum_{h=1}^{H} i\, Q\, i\; p \sum_{i=1}^{n} \qquad (2)$$

A closer look at this table indicates that some households are notably more productive than others, with some variation between households occurring in the relative sizes of the various sectors. This is not surprising, and is certainly worthy of further investigation. In addition, a deeper understanding of the links within and between households can be built up from the qualitative data to be analysed at a later date.

The total value of outputs of all economically productive activities in Pinang Jatus is Rp. 523,641,000, which gives an average per household value of Rp. 9,350,730. This figure is inserted in the formula in order to estimate the derived value of forest inputs.

6.3.3.3 The derivation of the use-value of forest inputs in Pinang Jatus

To compute this value, we need to sum across all households for all outputs and inputs, and the values of the forest residual $p_f F^h$ can be determined by re-arranging the known values, using the formula:

$$\sum_{h=i}^{H} p_f F^h = \sum_{h=1}^{H} \left(\sum_{t=1}^{n} p_t Q_t^h - (wl^h + rk^h + \delta K^h) \right) \qquad (3)$$

The forest residuals ($p_f F^h$) are shown in table 6.6 and represent the contribution made to the production process by land, i.e. the rent. It can also be described as the 'value added from nature', or the value of the forest resource to the Paser indigenous people of Pinang Jatus village.

In this particular case, for Pinang Jatus in 2005, the total of this value added from the forest is Rp. 352,491,000, of which Rp. 184,491,000 (34 per cent) represents the value generated by the anthropogenic use of non-timber products from the forest, and Rp. 112,000,000 is from timber products. This amount can be estimated because a number of trees used for timber are destined not only for subsistence construction, but also for the market. However, this is a temporary activity since the government has stopped the issuing permits for small-scale timber cutting. It is difficult to continue these activities as the government could confiscate any timber as an illegal product.

The population of Pinang Jatus consists of 265 men, women and children. On the basis of the above estimate of total value of rent, or added value from the forest, the per capita value for the village is Rp. 1,330,154 per year. Using this per capita figure, it is possible that for the average household in Pinang Jatus (4.73 people), the value of the contribution from the forest made to household income per year is Rp. 6,294,821. Rp. 695,192 of which is derived from NTFPs. The relatively significant amount of income accrued from the forest could have important implications for the people of Pinang Jatus. This shows again that NTFPs make an important contribution to increasing the per capita income of people in Pinang Jatus since farming only accounts for 20.94 per cent. NTFPs allow villagers to maintain their lifestyle even though their community still experiences poverty and a per capita income was only Rp. 2,047,509 in 2006. This is very low compared with the overall district of Pasir per capita income of Rp. 12,000,000 in the same year (BPS Pasir 2006).

Another way to look at the relative importance of the various productive inputs is to examine their relationship to the level of outputs. Table 5 shows that the total value of capital use in Pinang Jatus, in the form of foregone interest and capital depreciation, is Rp. 48,870,000. Table 6.6 shows that the total value of outputs in the village is Rp. 523,641,000. This illustrates that the capital and output ratio of this rural subsistence production system are low, with slightly less than 9.33 per cent of output being the result of capital input. These figures also show that the production system in this village is very labour intensive, with 73.10 per cent of output resulting from the efforts of labour. It is interesting to see that the contribution of the forest as a productive input is significantly more important in this village than the contribution of capital. The ratio of forest inputs to total output indicates that 64.96 per cent of output (in the form of the use of timber and non-timber forest products) results from the input of nature. This suggests that any removal of the option to use inputs would have a very significant effect on the well-being of these households.

6.4. Muluy village

Muluy is a resettlement village for Paser indigenous people. The village was developed in 2001 for the nomadic people in the area of the Muluy River. The village is located in the heart of the Gunung Lumut Protection Forest, about 59 km from the Kalimantan Trans-Highway of Long Ikis and 92 km from the district capital of Tanah Grogot. The village is part of the sub-district (*kecamatan*) of Muara Komam and consists of 22 households and 106 people. Due to its small population, this village has not been categorised as '*Desa*' by the government. This can be seen in the village infrastructure, which has no village staff or village head. This is one of the Swanselotung's housing cluster (RT) or '*Dusun*'. The difference between Muluy village and the other two research villages is the villager's cohesiveness in terms of following their *adat* chief, especially during the Palindung leadership.

The process of development in Muluy village was quite different from the other two villages in this study, since its population originates from only one area. This has the advantage that the community is more tightly-knit and cohesive and leads to stronger links between families and households. In contrast to the other villages, Muluy has evolved more naturally. In spite of this, individual Muluy households tend to be less typically Paser and more like the Dayak households in Meratus or the Mahakam Basin.

In terms of the analysis of how people in the area use the forest, Muluy provides a good set of household data from a survey of 22 houses, representing a total of 106 people. The survey includes all those households situated along the road that lies within 6 km of the base camp of the logging concession of PT. RKR.

The average household in the village is made up of 4.8 people, with a total of 48 men in the village, 33 women and 24 children. Overall, these households cultivate 17.6 hectares of land, which is divided into 18 farm plots with an average of 0.8 hectares per household.

Houses in this village are situated in a small settlement area in close proximity to each other. A few households have constructed their small house in the form of a 'village hut' where they stay during the agricultural rice plantation period. In terms of religion, Muluy adhere to Islam, although some traditions relating to their 'old' religion persist, especially in dealing with the cultivation and harvesting of rice, as well as in producing medicines. The village has a small government school with two temporary teachers, and no healthcare or public facilities. Many NGOs have used Muluy village as a target for their community development and to explore the link between indigenous people and natural resource use. However, there has been no significant change in village facilities or in terms of education and income as a result of these activities. This has led to the people of Muluy being wary of outsiders, and sometime it is difficult to get them to open up about their internal problems as they believe outsiders are not trustworthy.

6.4.1 Household labour input values

Household labour is calculated on the basis of the effective working hours of men, women, and children. The distribution of the estimated labour time between various economic activities in which the households are involved, is shown in Appendix8.1c and summarised in table 6.7 below. It can be seen that the total time spent by villagers in economic activities is 40,915 hours per annum, with 57.03 per cent spent in farming, 6.15 per cent on collecting rattan, 5.86 per cent on fuel wood collection, 5.86 per cent on logging and 6.45 per cent on the collection of other NTFPs. More than 40 per cent of their labour time is spent on non-timber forest products activities. This indicates that there is some similarity among the households. Nevertheless, there is also some variation of household activities. On average, 10 out of 14 activities are conducted by each household in order to meet their daily needs.

The total annual value of labour inputs in Muluy is calculated by applying a previously explained shadow labour value. This is taken to be employment in a logging concession. The value of labour estimated in this way is shown in the table below and, from this, it becomes clear that the total value of labour is Rp. 127,859,375, with an average per household of Rp. 5,811,789 per annum.

Table 6. 7. Labour inputs and its estimated values in Muluy in 2006.

Activities	Muluy			
	Household involved	Labour Spent (hours)	Estimated Labour values (Rp.)	% values
Farm	22	23,337	72,928,125	57.03
NTFPs:				
• Hunting	12	1,720	5,375,000	5.49
• Fishing	15	1,250	3,906,250	3.05
• Rattan	17	2,520	7,875,000	6.15
• Wild Honey	14	252	787,500	0.62
• Food/vegetables	22	1,056	3,300,000	2.58
• Fuel wood	22	2,400	7,500,000	5.76
• Handicrafts	6	450	1,406,250	1.09
• Palm wine	2	678	2,118,750	1.65
• Other NTFPs	22	2,640	8,250,000	6.45
Store keeper	2	840	2,625,000	2.05
Logging	6	1,032	3,225,000	2.52
Trading	-	-	-	-
Gold panning	-	-	-	-
Logging concession	3	1,368	4,275,000	3.34
Govt. services	2	1,372	4,287,500	3.35
Total	22	40,915	127,859,375	100
Average/household	10 activities	1,859,77/hh/year	Rp. 5,811,789.77/hh	-

6.4.2. Capital production values

The method of calculating household capital has already been discussed in the previous chapter, and from this, the value of productive capital items has been calculated, and is shown in the appendix. The value of the use of capital is again calculated on the basis of an imputed interest rate of 12 per cent, while capital depreciation is calculated at 20%.

The total value of productive capital used in the village of Muluy is Rp. 82,440,000, which, on average, equals Rp. 3,747,272 per household. The total cost of holding capital in Muluy (the imputed foregone interest) is Rp. 9,892,800 per annum, while capital depreciation at 20 per cent comes to Rp. 16,488,000. Once again, these figures indicate that the production process in the village is very labour intensive, with the capital to labour ratio being 4.95 per cent.

6.4.3. Estimating household output values

6.4.3.1. Farm output values

As with the other villages, survey data on farm outputs was collected from a number of sources for all households in Muluy village (with the exception of a few houses that were temporarily unoccupied during the fieldwork period). This data provides details about which crops were produced. Estimates of how much of each crop was produced annually were made both by farmers and senior male or female household members. Where possible, the farming data were collected from the households during interviews with family members, thus enabling some cross-checking to be done, and facilitating the development of a comprehensive account of farm outputs.

The value of these crop outputs is calculated on the basis of the average market prices for each crop, as given by the farmers in the village. These prices were also verified by observations in the nearest local market at Simpang Pait, in the sub-district of Long Ikis. For those households where people were temporarily absent, weighted averages were calculated for the total value of crop output, based on the size of the farm and the amount of household labour devoted to farming.

Estimates of the total value of all crops produced in the village of Muluy during 2006 are shown in table 6.3 and Appendix 8.2c. From these figures, it can be seen that the total value of farm outputs for the village in 2006 was Rp. 40,666,000. This gives an average farm output per household of Rp. 1,848,450 per annum.

6.4.3.2. Hunting and fishing values

Twelve households regularly are involved in hunting in Muluy and 15 households are involved in fishing. The average annual labour time spent on hunting activities is 143 hours per household, and 140 hours are devoted per household to fishing. The variety of wild animals hunted for meat and sold to the nearest market is shown in Appendix 12.

Birds are important to the hunters and trappers of Muluy village. This is illustrated by the figures shown in Appendix 8.3 and summarised in table 6.8 below. Again, this wildlife is mainly hunted for the purpose of household entertainment rather than for selling to the market as bush meat. The estimation of the economic value of hunting and fishing is shown in table 6.8 and comes to Rp. 3,900,000 for fishing and Rp. 3,600,000 for hunting. These activities consume 3.05 per cent of labour time for fishing and 4.20 per cent for hunting. Both of these values contributed to 3.75 per cent of the village output values.

6.4.3.3. Rattan harvesting values

The number of households involved in rattan harvesting in Muluy during the research period was 17 households, or 77.27 per cent of the households in the village. This high level of involvement in rattan collection is due to the culture of harvesting, which is conducted in groups of families and follows seasonal patterns. The method used to calculate the value of rattan harvesting involves measuring the volume of extraction in the year observed and multiplying this by the price of rattan at the village gate level.

As shown in table 8, the value of rattan harvesting in Muluy is Rp. 52,500,000. This figure comes from the production 150 tons of raw rattan in 2006. In reality, the amount could be higher, but cross-checks with the company which bought the rattan from Muluy village reveal similar amounts.

Rattan contributes to 26.27 per cent of the total village output values and it was the second largest source of income, after farm products, during 2006. Rattan is the highest source of economy from the NTFP sector.

6.4.3.4. Wild honey collection values

From Table 6.8 it can be seen that wild honey collection contributes 4.50 per cent of the total output values in Muluy's economy. This sector provides a source of labour for 14 households, with net output values of Rp. 8,212,500 per year. This value represents the importance of honey collection in household economies, in particular in terms of providing a household sweetener, which can be used as a substitute for industrially-produced sugar. Another important aspect of wild honey collection is the maintenance of the trees in which wild honey is hosted. If the forest where the *Koompassia* tree is found is not taken care of, then there will be a serious impact on honey production.

6.4.3.5. Handicrafts and palm sugar values

By employing the same methods of calculating handicrafts and palm sugar values as were discussed in the previous chapter, the value of palm wine and handicrafts can be measured in the village of Muluy. There are six households involved in handicraft and two households engaging in the collection of palm sugar. Together, these activities consumed 2.74 per cent of village labour time – 1.65 per cent for palm wine and 1.09 per cent for handicrafts. Only eight households in the village (36.36 per cent) are involved in these two sources.

The monetary value of these activities can also be measured using the methods described in the previous chapter and amounts to Rp. 560,000 per annum for handicrafts and Rp. 4,450,000 for palm sugar. The contribution of these sectors is only 4.51 per cent of the total village output.

6.4.3.6. Fuel wood values

As in most of the villages in this region, fuel wood is the main source of energy used for cooking in the village of Muluy. All households participate in the use of fuel wood and its economic value can be calculated using the level of consumption and the local market prices for wood used for fuel.

From the table in Appendix 8.1c it can be seen that the labour time used for collecting fuel wood in Muluy is 2,400 hours; an average 110 hours per household, per annum. From this, we can deduce that collecting fuel wood is one of the main activities of the people in the village, as all households and all family members are involved in this activity.

Appendix 8.2c shows that the monetary value of fuel wood is Rp. 13,200,000, or Rp. 545,000 per household, per annum. This value is the fourth most important source for meeting household needs and contributes to 6.61 per cent of the total village output values. Looking at the importance of this sector for the village economy also shows the significance of the forest in terms of providing free fuel wood for the people in the village, and again this has to be included in the calculation of the village values.

6.4.3.7. Fruits, foods and others NTFP values

A wide variety of forest plants and trees species are used by the people of Muluy for many purposes, as described in Chapter five. Using the same methods as those employed for the villages of Rantau Layung and Pinang Jatus, it is possible to calculate the value of fruit, food and other NTFPs in the village of Muluy.

Data from table 6.8, below, reveals the importance of these products, where all households are involved and high levels of labour time are committed to these activities. From ttable 6.3 and Appendices 8.1c and 8.2c it can be seen that the share of labour time for food and fruit collection is 1,056 hours, or 48 hours per household, per annum. 2,640 hours are given over to collecting other NTFPs, with the total for both sectors reaching 3,696 hours per annum. Appendix 8.2c and table 6.8 below reveal that all households are involved in these activities, which are very important for the village of Muluy.

In terms of monetary value, fruit and food account for Rp. 14,650,000, or Rp. 665,000 per household, per annum. NTFPs have a value of Rp. 17,400,000, or Rp. 790,910 per household, per annum. These values are 15.04 per cent of the total village output. Once again this proves the crucial importance of nature to the people and, therefore, it must be calculated into the total village output values.

6.4.4. Total input and output for village products

The value of all inputs and outputs for the village of Muluy are shown in table 6.8. From the figures, it is possible once again to determine the total value of the net village product and, thus, by derivation, the residual value of forest use by the people in this village.

Table 6. 8. Activities, output and residual value of forest in Muluy in 2006

Activity	Input and Output values					
	Hh Inv.	Labour input values (Rp.)	Share of input %	Output values (Rp.)	Share of output %	Net output values per sector (Rp.)
Farm	22	72,928,125	57.03	40.666,000	20.35	-32,262,125
NTFPs:						
• Hunting	12	5,375,000	4.20	3.600,000	1.80	-1,775,000
• Fishing	15	3,906,250	3.05	3.900,000	1.95	-6,250
• Rattan	17	7,875,000	6.15	52.500,000	26.27	44,625,000
• Wild Honey	14	787,500	0.62	9.000,000	4.50	8,212,500
• Food/fruits	22	3,300,000	2.58	14.650,000	7.33	11,350,000
• Fuel wood	22	7,500,000	5.86	13.200,000	6.61	5,700,000
• Handicrafts	6	1,406,250	1.09	0.560,000	0.28	-846,250
• Palm wine	2	2,118,750	1.65	8.450,000	4.23	6,331,250
• Other NTFPs	22	8,250,000	6.45	17.400,000	8.71	9,150,000
Store keeper	2	2,625,000	2.05	2.500,000	1.25	-125,000
Logging	6	3,225,000	2.52	8.800,000	4.29	5,575,000
Concession	3	4,275,000	3.34	12.600,000	6.42	8,325,000
Gov. services	2	4,287,500	3.35	12.000,000	6.01	7,712,500
-Cost of capital (12%) -Depreciation (20%)		13,493,288 22,488,000				
Total	22	163,840,712	100	199,822,000	100	
Input-output (Total Net Village Product)/forest residues						35,981,288
Net forest residues per-household						1,635,513.09

*): Data for Muluy is based on the collected data in 2006 or one year after the collection in Rantau Layung and Pinang Jatus. There is no significant difference in the economic situation between 2005 and 2006 and this made it possible to compare the economic conditions of Muluy, Rantau Layung and Pinang Jatus.

As with the other villages in this study, inputs into the village production of Muluy are limited to the use of labour, the use of capital, and the use of nature in the form of forest use. The total annual value for this village input is Rp. 163,840,712. The value of all these village inputs is combined with all the values of outputs to produce the value of the net village product.

Since the land in this village is perceived as communal property, no calculation is made for land rent. This implies that households are not subject to government taxation. Using equation (2) from the previous chapter to calculate the value of NVP, it can be seen that the total value of village product for Muluy in 2006 was Rp. 199,822,000. After deducting the total village input, the residual is Rp. 35,981,288. Taking the 22 households of the village, this suggests that the average net value of household output is Rp. 1,635,513 per annum. This is the product of time and effort of household members, the input of product capital, and the use of nature in the form of non-timber forest products provided by the forest ecosystem.

6.4.5 The derivation of the value of forest inputs in Muluy

As in the other villages, the value of forest inputs is derived as a residue. Table 6.8 above and Appendix 6 show that the total forest residual value is Rp. 35,981,288, giving a household average of Rp. 1,635,513.09 per annum. This significant figure is the amount that can be said to be value added to production as a result of the use of nature in the form of timber and non-timber forest products by the households.

It can be seen from table 6.8 that the differences between the input and output values have shown positive residues in general, but in some sectors, such as farming, hunting, fishing, handicrafts, and storekeeping the residue is negative. This can be explained by the fact that many households were not producing rice due to attacks by pests and animals. The same is true for hunting and fishing outputs. Many hours and trips have been spent hunting without bringing back any animals or fish. In terms of handicrafts, it could be the result of an underestimation of outputs as the products were mainly used for subsistence, and the activity was conducted at varying times, which may not have been covered by the interviews.

6.5. Conclusions

The calculated figures for the value of non-timber forest products in the three research villages actually represent the value added to labour and capital inputs by the use of the primary resource – land and forest. This amount, therefore, is equivalent to the rent of that factor of production. This figure is not insignificant, and it would certainly be important to include such rents in any assessments of alternative development strategies.

Since exploitation of this natural capital in these villages is small-scale and considered to be non-depleting, it is not necessary for this analysis to depreciate the value of natural capital use. The important factor to consider in this case, however, is the fact that this estimated level of rent accruing to land and nature, as a result of these uses of non-timber forest products and services of that resource is, *ceteris paribus*, an infinite income stream. This has significant implications for sustainability, and it is important that, if the quality of the income stream is to be preserved, action must be taken to ensure that this communal property resource is not depleted by the decisions and actions of the current generation of both local residents and policymakers.

Estimates such as these can be used as an indicator of the amount of compensation that would have to be paid in the event of such villages losing their access to the forest as a household input. Such a situation may arise, for example, in a location that is to be taken over for the development of timber estate, logging concessions and palm oil in the research villages. This would result in the loss of access to this common property resource. These figures, when combined with estimated timber values (from concessions) could also be used as a guide for the purpose of evaluating the cost of a palm oil plantation, forest fire, flooding, or other such ecological disruption. There is no doubt from this analysis, that the importance of NTFPs has not been highlighted in the current government programme for forest timber cutting and for the development of palm oil. The data shows that the existence of the forest is important for food security in villages such as these. In addition, the role of non-timber forest products is essential to the lifestyle of these forest dwellers, as without the contribution of forest products and services, the whole way of life of Paser people would be unsupportable. It also suggests that it is certainly in the interest of the Pasir District policymakers to look more carefully at total forest income potentials, rather than concentrating solely on the timber income potentials of forest resources.

Inevitably, as with any survey-based approach, there is bound to be a degree of error in these calculations, and so an element of error will exist in the valuation estimates demonstrated here. The procedure of using an income accounting framework to estimate the value the use of non-timber forest products and services is one which, to some extent at least, overcomes some of the more major difficulties associated with conventional valuation methods. On the basis of the accounting methodology used here, in each of the villages, the proportion of output accounted for by forest inputs is not unimportant. Therefore, even taking any error into account, the value added from nature, as demonstrated by this analysis, is quite significant. For example, as a proportion of the Net Village Product, the value of these forest inputs represents 36.79 per cent in Rantau Layung, 42.29 per cent in Pinang Jatus and 72.39 per cent in Muluy. Possible reasons for the differences that exist between the villages' economy and NTFPs contribution to household economy will be examined in the next chapter.

Chapter 7

The comparison of the economic value of NTFPs to the economies of the three research villages

7.1. Introduction

Through close inspection of the data from three villages, Muluy, Pinang Jatus and Rantau Layung, it is possible to make comparisons and identify how resource-use differs between them. Some of these differences highlight the various livelihood choices available in these villages, and indicates the trade-off which may exist between different choices set. Some of geographic and demographic characteristics of the villages are highlighted in the second section, followed by an examination of the differences in the levels of household capital and its distribution within the villages in Section 3. Section 4 addresses the issue of the use of forest inputs in village production. An analysis of village production functions is provided in Section 5, followed by some conclusions in Section 6.

7.2. Geographical and demographic characteristics of the villages

Table 7.1 describes the characteristics of the village research sites. These villages have many similar characteristics. Although this is a relatively small sample, these similarities suggest that the Paser population in the research area is relatively homogenous in lifestyle and in socio-economic profile. The findings relating to the households of this study may well apply to other similar households in this type of environment.

Table 7. 1. Basic characteristics and attributes of the three villages (Source: LPMD Pasir 2004 and field observation 2005).

Attribute	Rantau Layung	Pinang Jatus	Muluy
Population	206	265	106
Number of households	45	56	22
Average age of senior woman in households	42	46	48
Average education level	SD**	SD**	Not educated
Average size of farm	1.4	2.2.	0.8
Location	Kasunge River, Sub district of Batu Kajang	Jatus River, Sub district of Long Kali	Muluy River/Gn Lumut, Sub-district of Muara Komam
Means of transport and hours of travel from the nearest market	4 hours	1 hour	3 hours
Position above sea level	+280 m	+150 m	+800
Religion	Muslim	Muslim and Christian	Muslim
Village economic status*)	Poor /*tertinggal*	*Swadaya* /self regulated	Very poor/*tertinggal*

*) the terms for village economic status based on the government assessment in 2001: *tertinggal* means very low development, *swadaya* means less development. The level of development or village status is assessed by the various indicators, for example, accessibility from the capital of the district, availability of public health facilities, education, electric, average highest life expectancy, etc.(LPMD Pasir 2004).
**) SD = *Sekolah Dasar* or primary school

Although Pinang Jatus has the largest number of households, the geographical nature of its location (as a village along a road) means that individual households are highly dispersed. Otherwise, the households of Pinang Jatus are very similar to those found elsewhere in smaller settlements. As a social group, Pinang Jatus appears to be less cohesive than the other villages. Indeed, divisions within the villagers on the basis of religion (Christians and Muslims) were quite apparent. The farms of Pinang Jatus are larger (2.2 ha per households) than those in the other two villages; however, the soil is relatively poorer.

The average of organic content of soil samples was taken at a number of sites in each village. From this it can be seen that the soil in Rantau Layung is richer in nutrients than the other villages, particularly compared to Pinang Jatus. The average organic matter in the soil at Pinang Jatus is 5.4 per cent, in Rantau Layung it is 7.2 per cent and in Muluy it is 6.8 per cent (PPLH UNMUL 2002). These soil samples also indicate that in the three villages, the farm soil (just after clearing and burning) has a higher organic content than the soil taken from non-farm (forest) sources. This demonstrates the short-term enriching effect of the slash-and-burn methods used in these villages, and bears out the well-known fact that the nutrients in areas of forest are predominantly in the vegetation, rather than in the soil. This is further explained by fact that in the three study villages, the rivers are characterised by dense forest cover. During the rainy season there is a high sediment load in the river. During the dry season the flow suddenly drops to a very low level of debit as a result of the inability of top soil to retain rain water (PPLH UNMUL 2002). One way in which farmers could possibly improve soil quality in these areas, would be to plant nitrogen fixing trees and crops in their fields. This strategy could be incorporated with other agroforestry measures to try to improve farm productivity. Clearly, however, this is an area requiring further research, including field trials, to investigate the impact and effectiveness of such schemes.

7.3. Comparison of labour supply and sector outputs

Table 7.2 and figure 7.1 show the different labour supply in the village research sites. The difference is significant in terms of the percentage of the sector to total village output. In this chapter, I will discuss the differences in the village activities and their contribution to the village output.

The variation in the quantity of labour supplied by households in the villages tends to support the idea that farmers in Rantau Layung benefit from good soil, yet they are not motivated to work it to its full potential. As can be seen from table 7.2, the total number of household labour hours is lowest in Muluy and highest in Pinang Jatus, with households in Rantau Layung falling between the two. These data suggest that households with better environmental or economic endowments, such good soil (Rantau Layung), or better market access (Pinang Jatus), will need to put in less labour than those where natural and economic conditions are less favourable (Muluy). This highlights the fact that within the classification of 'subsistence agriculture', there is a degree of heterogeneity amongst households. This is demonstrated in the study villages by the fact that the percentage of household labour time spent on farming in Rantau Layung is higher than in Pinang Jatus and Muluy.

Table 7. 2. The comparison of labour inputs in the researchvillages' economic activities

Activities	Labour supply (hours/year)					
	Rantau Layung		Pinang Jatus		Muluy	
	labour	%	Labour	%	Labour	%
Farm	46,000	49.05	59.232	48.96	23,337	57.03
NTFPs:						
• Hunting	10,400	11.09	17.297	14.29	1,720	4.20
• Fishing	3,000	5.37	10,800	8.90	1,250	3.05
• Rattan	5,040	1.27	987	0.82	2,520	6.15
• Wild Honey	1,200	3.20	10,576	8.74	252	0.62
• Food/vegetables	1,584	0.92	3,080	2.54	1,056	2.58
• Fuel wood	10,400	1.68	2,125	1.75	2,400	5.86
• Handicrafts	864	0.45	1,164	0.96	450	1.09
• Palm wine	816	0.87	1,028	0.84	678	1.65
• Other NTFPs	11,200	11.94	4,182	3.45	2,640	6.45
Store keeper	8,000	8.53	2,393	1.97	840	2.05
Logging	4,224	4.50	6,400	5.29	1,032	2.52
Trading	128	0.13	800	0.66	-	-
Gold panning	896	0.96	896	0.74	-	-
Logging Concession	-		-		1,368	3.34
Govt. services	3,360	3.58	3,360	2.77	1,372	3.35
Total	**93,780**	**100**	**120,960**	**100**	**40,915**	**100**

Source: Field observation 2006

The share of labour time spent on farming in Pinang Jatus is 48.96 per cent, in Rantau Layung it is 49.05 per cent and it is 57.03 per cent in Muluy. On average, the highest household involvement in all sectors is found in Muluy, where each household participates in, on average, 10 out of 14 activities. This is higher than Pinang Jatus, where households' participate in only 5 out of 14 activities, and in Rantau Layung where participation is in 7 of 14 activities.

Table 7.2 shows how the labour is used by households in the different villages. By examining the average values of the labour sector, it can be seen that for the villages of Rantau Layung and Pinang Jatus, more than 60 per cent of labour time is spent on farming and fuel wood collection and about 32 per cent of efforts go towards rattan collection, fuel wood and fishing. These three sectors have the highest labour consumption of all NTFP activities. This indicates that for those in Pinang Jatus, where farming is less productive, significant time is spent on other forest based activities, such as logging, hunting, and collecting small amounts of NTFPs such as honey and rattan. The relatively large number of hours spent collecting NTFPs from the forest in all villages indicates the important role played by the forest in the survival strategies of the poorest forest households.

The analysis of labour use in different activities within villages suggests that households respond differently to the various constraints they face. Taking the villages individually, it can be shown that there is a clear difference between them in terms of the relationship between the value of total output, and the amount of labour used. This can be demonstrated by comparing labour values with output values, which produces a ratio of 67.27 per cent for Rantau Layung, 72.18 per cent for Pinang Jatus and 63.98 per cent for Muluy. This confirms that for households in Pinang Jatus, labour seems to be a much more significant input to production than in Rantau Layung and in Muluy. However, this could be a temporary situation since the farm output values in Muluy were underestimated, due to the impact of a crop failure during the data collection for this study.

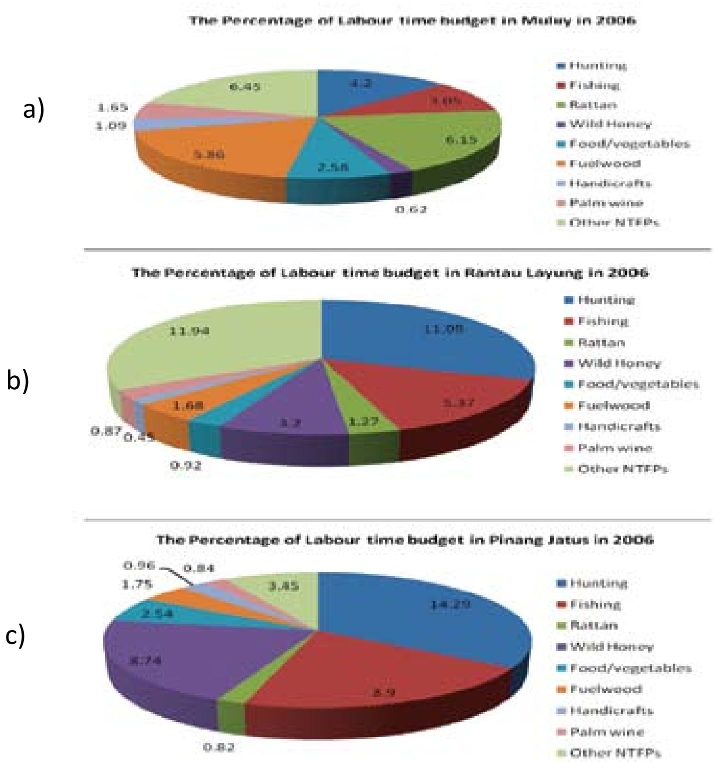


Figure 7. 1. The comparison of labour time budget in the three research villages

Examining labour productivity, it is found that the labour price in Muluy is more productive than in the other villages. Based on the calculation of total output and the total input in these villages, one hour of labour in Muluy earns Rp. 4,883. This price is more than in the village of Rantau Layung where it is Rp. 4,645 and in Pinang Jatus where one hour of labour is worth Rp. 4.356. It is surprising that these village labour prices are all above the opportunity cost of working in the logging concession, which is priced at Rp. 3,125 per hour. This could be one of the reasons why the Paser people do not have much interest in working in logging concessions, since their daily forest and farm activities could earn them more.

Table 7. 3. The comparison of labour price based on output and labour time in the three research villages.

Village	Total Output (1)	Labour time (2)	Labour Price (1:2)
Rantau Layung	Rp.435,632,000	93,780 hours	Rp. 4,645/hour
Pinang Jatus	Rp.533,641,000	122,494 hours	Rp. 4,356/hour
Muluy	Rp.199,822,000	40,915 hours	Rp. 4,883/hour
All villages	**RP. 1,169,095,000**	**257,189 hours**	**Rp. 4,545.66/hour**

Notes: labour price is equal to US$.0.5 per hour ($.1 = Rp. 9,000)

7.4 Comparison of household capital distribution in each village

The total value of productive capital in each village was shown in the previous section and this effect on the productive capacity of the villages is indicated by a correlation between total productive capitals and the total value of village output. As in any other economic system, those using productive capital most efficiently will accumulate more wealth, and this has occurred in a number of households in the three villages. Although the number of households is greatest in Pinang Jatus, the total productive capital is clearly greatest in Rantau Layung, where there are fewer households than in Pinang Jatus. The level of productive capital available to households is, on average, also greatest in Rantau Layung. This correlates with the fact that it is the most productive of the three villages.

Table 7. 4. Comparison of capital availability in the three research villages (Rupiah) (based on field work 2006) .

Capital and values	Rantau Layung	Pinang Jatus	Muluy
Total village productive capital	296,212,000	244,350,000	82,440,000
Average productive capital, by household	4,881,480	4,363,392	3,747,272
Cost of total village productive capital use per annum	30,460,440	29,322,000	9,892,800

The cost of household capital use is made up of the cost of holding that capital (the foregone interest), and the depreciation of that capital over time. This is calculated on an annual basis and is shown in table 7.5.

Table 7. 5. Comparison of cost of holding capital in the three research villages (Rupiah) (based on field work in 2006).

Cost of capital use	Rantau Layung	Pinang Jatus	Muluy
Capital cost per year (12%)	30,460,440	29,322,000	9,892,800
Depreciation (20%)	50,767,400	48,870,000	16,488,000
Total Productive capital use per-year	81,227,840	78,192,000	26,380,800
Average productive capital use (Rp) per-hh	1,805,063	1,396,285	1,199,127

From this table it can be seen that, on average, households in Rantau Layung use considerably more capital in the production process than households in either Pinang Jatus or Muluy. The effects of using higher levels of capital in production suggests that output levels will be greater. However, in the case of these villages, production is very labour intensive, so variation in levels of capital use have only marginal effects on output relative to the ratio made by labour.

7.5 Comparison of capital stock distribution

Productive capital is distributed between the households in the three study villages as follows: The majority of households in the three villages have low to middle standards of living, with just a few households reaching higher levels. My fieldwork shows that in all cases, those few households with greater productive capital stock are those owning valuable equipment such as chainsaws, motorbikes and canoe engines.

This figure clearly shows that 82 households fall withi this range, and the majority of these Paser households owned productive capital stocks worth between Rp. 2 million and Rp. 32 million. A total of 7 out of the 123 households included in the survey have productive capital holdings of Rp. 32 million or more, and 34 households have capital stock of less than Rp. 2 million. By looking more closely at each village, we can see the villages differences in terms of capital distribution. This comparison illustrates the relatively higher levels of capital stock available for production in Pinang Jatus, where 12 households (21 per cent) have productive capital holdings of over Rp. 15 million, while in Rantau Layung the corresponding number is only 4 (8 per cent), and in Muluy, 2 (9 per cent) have holdings of more than Rp. 15 million. In addition, although the village of Rantau Layung is the richest overall in terms of capital holdings, the distribution of the income is more unequal, with more households having a lower range of incomes. However, in comparison to Pinang Jatus, a higher proportion fall into the higher income groups.

7.6 Comparison of households' output values

All farms in these villages use a system of slash and burn and later use a system of inter-cropping, in which a large number of different crops are grown in the field. This is a typical pattern found in forest communities such as these (Dove 1998; Matius 2004).

Table 7.6 shows the sectors' output values for all activities in the research area. This data shows how the value of forest inputs varies both between the activities involved and between villages. The values shown in some sectors reflect situations where the estimated inputs in those sectors may be greater than the estimated outputs. This is because the relevant output is too small to have been included here. To correct this, more detailed information on these micro-consumption values would need to be collected at a future date.

The distribution of forest inputs across the various sectors at a household level in each village, as shown in table 7.6, also indicates the relative importance of forest inputs in the various income generating activities of the households. It again highlights the fact that the high value of forest inputs such as fishing, rattan, honey, as well as other NTFPs and farming in Pinang Jatus, reflects the higher prices in that area for outputs generated by forest resources. This figure shows the relatively low monetary value of plant collection from the forest for various uses, but since this plants provide fuel, medicines, food and vegetables, handicrafts material, the full value of their worth must reflect all of these.

The larger numbers of households that use forest plants, relative to the numbers involved in fishing and collecting fuel wood, is another dimension of the importance of forest resources. In addition, the reliance placed on such plants by a large proportion of the households in these villages reflects the importance of the forest itself for local inhabitants.

Table 7. 6. Comparison of households' output values in the study villages (based on field observation in 2005 and 2006).

Activity	Rantau Layung			Pinang Jatus			Muluy*)		
	Hh Inv.	Value Rp.mio	%	Hh Inv.	Value Rp.mio	%	Hh Inv.	Value Rp.mio	%
Farm	45	88.540	20.32	56	109.560	20.94	22	40.666	20.35
NTFPs:									
• Hunting	5	4.749	1.09	7	12.926	2.64	12	3.600	1.80
• Fishing	15	7.792	7.78	18	27.500	5.37	15	3.900	1.95
• Rattan	22	22.520	5.16	25	36.600	6.98	17	52.500	26.27
• Wild Honey	18	10.495	2.49	18	8.640	1.67	14	9.000	4.50
• Food/vegetables	14	13.853	3.17	37	23.120	4.41	22	14.650	7.33
• Fuel wood	45	15.222	3.49	56	25.000	4.77	22	13.200	6.61
• Handicrafts	4	20.08	0.46	14	10.200	1.96	6	0.560	0.28
• Palm wine	2	4.550	1.04	5	4.500	0.85	2	8.450	4.23
• Others NTFPs	45	48.190	11.06	56	36.000	6.97	22	17.400	8.71
Store keeper	5	27.320	6.27	5	3.590	0.68	2	2.500	1.25
Logging	4	98.050	22.51	7	112.000	20.66	6	8.800	4.29
Trading	2	1.830	0.42	6	12.000	2.29	-	-	-
Gold panning	6	29.90	0.68	-	-	-	-	-	-
Concession	-	-		8	56.000	10.32	3	12.600	6.42
Govt. services		72.000	16.52	8	46.000	8.57	2	12.000	6.01
Total	**45**	**435.632**	**100**	**56**	**523.641**	**100**	**22**	**199.822**	**100**
Per household		**9.680.7**	**-**		**9.350.7**	**-**		**9,082.82**	**-**
The average of all village is Rp. 9,391,048 per household or Rp. 1,988,156.08 per capita									

*): Data for Muluy is based on data collected in 2006 or one year after the collection in Rantau Layung and Pinang Jatus. There is no such significant difference in the economic situation between 2005 and 2006 and this made it possible to compare the economic conditions of Muluy, Rantau Layung and Pinang Jatus.

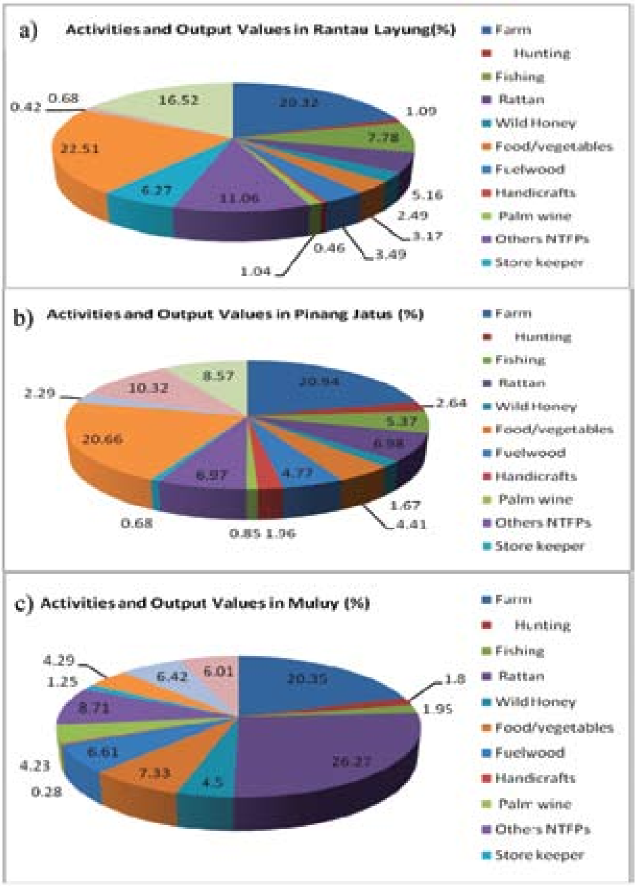


Figure 7. 2. Comparison of activities and output values in the three research villages (based on fieldwork in 2006).

It is interesting to note the significant differences that exist between the villages in terms of production of specific crops. These differences are the result of variation in households tastes (for example, the large amount of coffee being grown in Rantau Layung, local demand for *Aleurites mollucana* (*kemiri*) nuts in Pinang Jatus and cassava in Muluy) and show how households vary in their response to their environment and geographical factors, such as soil and water supply.

Marketing conditions are another significant influence on farm output. The pattern in Rantau Layung and Muluy tends to reflect the strong localised nature of production and trade. In Muluy, on average, 92 per cent of output is used at home, and only 8 per cent is sold, mostly in the village. A similar situation is found in Rantau Layung where most of the products are consumed at home and only 18 per cent of them are sold, both in the market and at the village level. This contrasts with the figures for Pinang Jatus, where different conditions exist. The village is nearer to the market and it is accessible by road, making it much easier for villagers to transport their produce in bulk. In this village, only 64 per cent of farm output is used at home and 36 per cent is sold or exchanged. Figure 7.2 below shows the distribution of total households output values in the villages.

Although some variations in prices for farm produce do exists between the villages, it seems likely that these are influenced more by market access conditions rather than by demand and supply factors. This is because, on average, prices in Rantau Layung are generally lower than in other villages, reflecting the fact that very few buyers come to this village, resulting in a lower level of effective market demand. Although the situation in Rantau Layung is one where potential farm productivity is greater, lower frequency of visits of traders means there is little motivation for farmers to increase their output significantly, due to the difficulty associated with transportation of large volumes of crops. In Pinang Jatus, however, farmers are encouraged to produce a higher level of output, as a result of the high prices brought about by the strong and effective demand from consumers in Simpang Pait. As a result, most of the crops produced are sold at higher prices.

Table 7. 7. Comparison of forestry and farm products prices at village gate levels in the three research villages (based on fieldwork in 2006).

Farm Products		Village gate prices (Rp)		
		Rantau Layung	Pinang Jatus	Muluy
1.	Rice, per-kg	3,500	3,750	3,600
2.	Rattan, per-kg wet	450	500	350
3.	Coffee, per-kg dry	5,000	5,500	4,750
4.	Durian, per-unit	3,500	4,000	2,500
5.	Mango, per-kg	2,000	2,500	2,250
6.	Bananas, per-unit	15,000	16,500	17,000
7.	Beans, per-kg	6,500	7,000	5,000
8.	Cassava, per-kg	750	700	850
9.	Chili, per-kg	4,500	5,000	4,000
10.	Pineapple, per-unit	1,250	1,500	1,750
11.	Timber (m3)	450,000	450,000	450,000
12.	Gold (gram)	98,000	-	-
13.	Bush meat (Kg)	7,500	7,500	5,000
14.	Durian (Kg)	3,500	5,000	3,000
15.	Chicken (domesticated)(Kg)	35,000	35,000	35,000

Source of data: The result of field observation in September 2006.

7.7 Comparison of forest inputs in household output production

In addition to the use of labour and capital to produce output, households in these villages make use of a significant amount of forest inputs in the production process. The total value of these forest inputs in each village is shown in table 7.6. Figure 7.3 shows how these forest inputs contribute to the output values of the villages.

The varying degrees to which individuals make use of such forest resources highlights the fact that household survival strategies vary considerably according to local and regional conditions. While trade-offs will exist between the different available choices, it is clear that in most households, open access use of these common property resources is an important de facto right for Paser people living in the forest, and one which can only be protected by ensuring continued survival of the forest ecosystem. The distribution of forest inputs across the various sectors at a household level in each village is shown in Table 7.8. Figure 7.3 also indicates the relative importance of forest inputs in the various income generating activities of the households. This once again highlights the fact that the high value of forest inputs in fishing, rattan, honey, and others NTFPs and farming in Pinang Jatus, reflects higher prices in that area for outputs generated by forest resources. This figure shows the relatively low monetary value of plant collection from the forest for various uses. However, since these plants provide fuel, medicines, food and vegetables, handicrafts material, the full value of their worth must reflect all of these.

Table 7. 8. The comparison of forest output values in three Paser villages 2005.

Activity	Rantau Layung		Pinang Jatus		Muluy*)	
	Rp.mio	%	Rp.mio	%	Rp.mio	%
NTFPs:						
• Hunting	4.749	1.09	12.926	2.38	3.600	1.83
• Fishing	7.792	7.78	27.500	5.06	3.900	1.99
• Rattan	22.520	5.16	36.600	6.74	52.500	26.80
• Wild Honey	10.495	2.49	8.640	1.59	9.000	4.59
• Food/vegetables	13.853	3.17	23.125	4.26	14.650	7.48
• Fuel wood	15.222	3.49	25.000	4.61	13.200	6.74
• Handicrafts	2.008	0.46	10.200	1.87	-0.560	0.28
• Palm wine	4.550	1.04	-4.500	0.82	8.450	2.47
• Other NTFPs	48.190	11.06	36.000	6.63	17.400	8.88
Logging	98.050	22.51	112.000	20.66	8.800	4.49
Logging Concession	-		56.000	10.32	12.600	6.43
Total	227.429	52.20%	352.498	64.96%	127.277	64.99%
Total without logging	129.379	29.69%	184.498	34.00%	105.877	54.06%

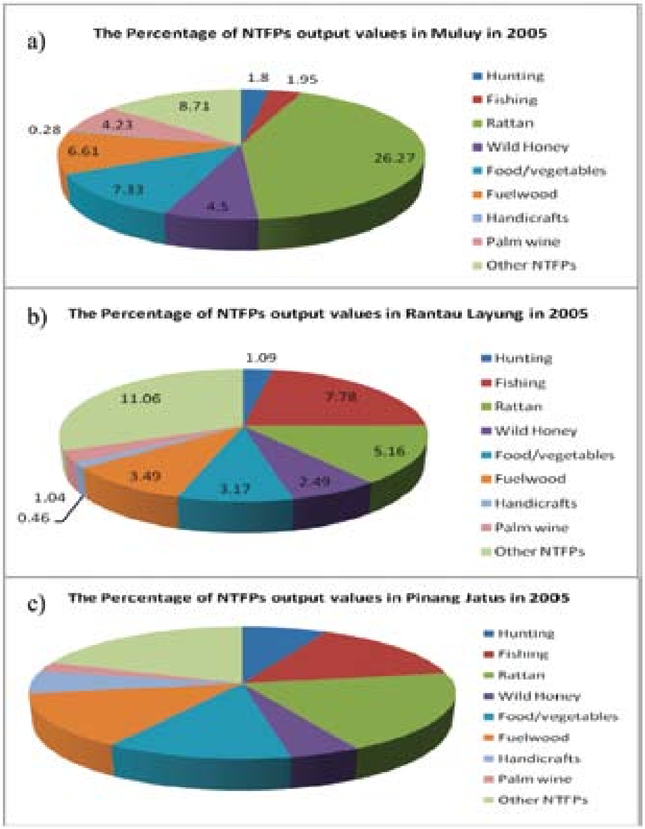


Figure 7. 3. Comparison of NTFP output values in research villages.

The large numbers of households that use forest plants, relative to the numbers involved in fishing and collecting fuel wood, is another dimension of the importance of forest resources. In addition, the reliance placed on such plants by a large proportion of the households in these villages reflects the importance of the forest itself for local inhabitants.

Table 7.9 highlights the importance of plant use in these villages. In addition, it demonstrates the importance of rattan and honey. Of the plants collected from the forest, some are used at home, while some are used for sale or exchange. Taking the plants that are collected from the forest in Rantau Layung, excluding rattan, honey and fuel wood, most plants (82 pe cent) are consumed at home, while 18 per cent are sold to the nearest market. Similar figures exist for Pinang Jatus where 79 per cent of plants are consumed and only 21 per cent sold or exchanged with neighbours or the nearest market. By contrast, in Muluy, 94 per cent of plants collected are used at home, while only 6 per cent are used for sale or exchange.

Table 7. 9. Comparison of the output values of forest plants sources, including rattan and honey.

Activity	**Rantau Layung**		**Pinang Jatus**		**Muluy*)**	
	Rp million	% to total village output	Rp million	% to total village output	Rp million	% to total village output
• Rattan	22.520	5.16	36.600	6.74	52.500	26.80
• Wild Honey*	10.495	2.49	8.640	1.59	9.000	4.59
• Food/vegetables	13.853	3.17	23.125	4.26	14.650	7.48
• Fuel wood	15.222	3.49	25.000	4.61	13.200	6.74
• Other NTFPs	48.190	11.06	36.000	6.63	17.400	8.88
Total Plants values	110.280	25.37%	129.363	23.83%	106.750	54.49%

- *the inclusion of honey in the plants products is due to the role of honey trees of Koompalsia spp. as the host for wild bees.*

It is interesting to examine how individual households use forest plants. For those households participating in the collection of plants from the forest on a regular basis in Muluy, for example, the average value of those collected plants was Rp.4,852,272 in 2005. This a not insubstantial figure, and is higher than the corresponding figures for both Rantau Layung – Rp.2,450,666 and Pinang Jatus – Rp.2,310,053. These figures suggest that householders in Muluy in particular make greater use of forest plants than householders in the other villages. Nevertheless, the collection of wild plants from the forest is an important activity for almost all households.

Another factor to be considered is the fact that that forest foods and vegetables are an essential supply of vitamins and minerals to the often impoverished diet associated with subsistence households. Furthermore, the importance of handicrafts to households in all villages can be seen from table 8. However, it is important to note that this may also be an under representation of their full value, since all households produce some craft for their own domestic use, but only those households doing handicraft regularly to earn income have been included in these figures.

When questioned about the use of the forest, and the items which would be missed most if they were to disappear, the responses of householders varied between the villages. Householders in all the villages showed a high proportion of responses indicating that food would be missed, with the figure for Rantau Layung being 33 per cent, with a total of 28 per cent being made up of wild forest fruits. In Pinang Jatus the figure indicating that food would be missed was 18 per cent, with 7 per cent mentioned specifically as vegetables and fruit. In Muluy, 42 per cent mentioned food and vegetables, with 18 per cent mentioned as fruits. This confirms the idea that forest foods are of major importance for forest dwelling people, and that they supply essential vitamins and minerals to their diet.

In addition to food items, building materials are considered of great importance in a village. In Rantau Layung, 52 per cent of responses indicated building materials as an important item that would be missed. The figures were similar for the other villages, with 42 per cent in Pinang Jatus and 49 per cent in Muluy. One of the possible reasons for this low variation between the actual use of plants and appreciation of their importance is the fact that medicinal plants are usually collected and used by women, whereas the respondents to the questions on what would be missed if the forest disappeared were both men and women. It is likely that men wouldnot necessarily think of medicinal plants as readily as women.

a)

b)

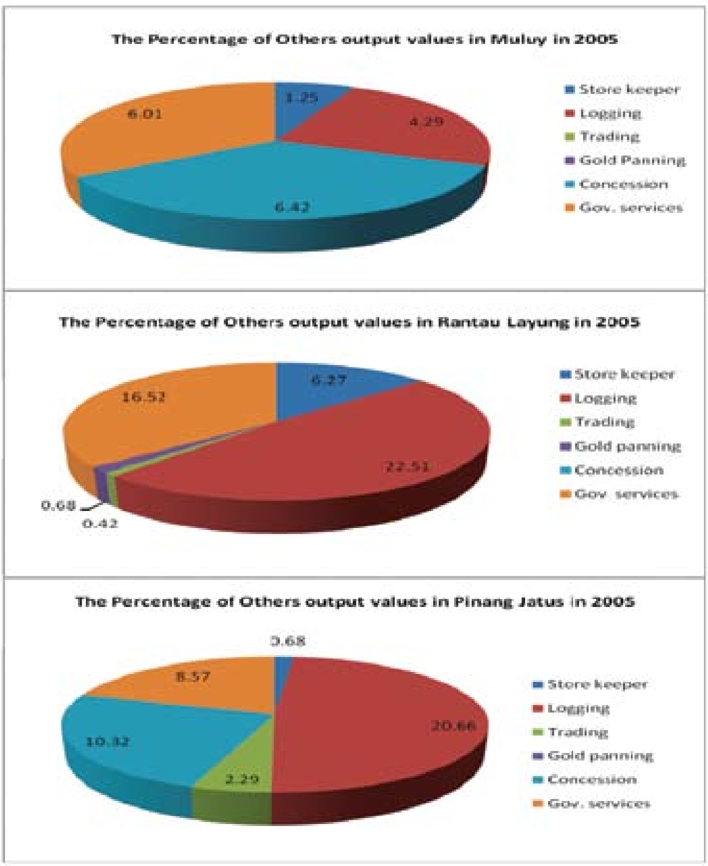


Figure 7. 4. Comparison of non-farm output values.

Other frequently occurring illnesses are fever, malaria, stomach ache and colds. Since the medicines for these diseases are not available in the village healthcare centres, householders are even more reliant on the use of forest plants and often prefer to treat themselves using medicinal plants from forest. On average, women knew of and regularly used 22 different medicinal plants (see Chapter 5). According to 56 women surveyed, children suffered from the most illness, most of which occurred between November and January. This was thought to be because during the wet season, water in the rivers is easily polluted by erosion from logging activities. As a result, less opportunity exists for taking clean drinking water from the river. Also, small pools of stagnant water (breeding grounds for mosquitoes) are left standing after rains. The widespread use of medicinal plants in these villages again highlights the importance of non-timber forest products to forest dwelling people, and it is clear that this importance goes well beyond the monetary sphere.

In all of these villages, a wide variety of fish are caught, and those listed here are the major ones, most commonly found in catches in the wet season (September to November). Details of the types of fish most widely caught in the research area are shown in the appendix to Chapter 5. From this it can be seen that there is some variation in the types of fish caught in the fishing grounds of the different villages.

Although the presence of some species is seasonal, it is acknowledged by all the fishermen in this area that fishing in the wet season is more difficult than in dry season, when fish populations tend to be more concentrated in smaller bodies of water. It is interesting to note that fish catches were selective due to the fact that some fish could contain poison and would be dangerous to consume.

7.8. Analysis of village production functions

The analysis of production functions in all types of economy has produced a massive literature. From this it can be seen that the attempts to model production activities both in industrial and agriculture sectors, is a complex task. Clearly the data requirements and models suitable for industrial economies are different from those found in subsistence economies such as the ones in this study. Nevertheless, it is possible to analyse some aspects of subsistence production activities using conventional analytical techniques.

The classical study of Bliss and Stern (1982) makes a detailed examination of production and other economic activities within a rural Indian village and shows the value of using standard analytical techniques in non-standard situations. Other writers have looked more specifically at agricultural production, both from a bottom-up representative farmer approach, and from a top-down national counting approach, where the more macro-economic dimensions of agriculture and its relations with other sectors of the national economy, are examined. Village level analysis has also been done, and these combine aspects of the two other approaches, allowing a bottom-up approach to be applied to a more macro-economic framework (Biggs 1982). This approach has a number of disadvantages, and in addition to facilitating a more detailed study of inter-community markets and market failures, it allows for a more specific approach to development options to be taken, in accordance with the needs of different local communities.

Referring to the input-output table described in the previous section, we can summarise that the forest residual values in each village can be calculated, as shown in table7.10, below. From this table it can be seen that the households in the village of Muluy receive more forest residual values than the two other villages. It can also be stated that the households in Muluy are more dependent on the forest. The household residual value is Rp.1,635,513.09 in Muluy, Rp. 682,842.32 in Pinang Jatus and Rp. 1,061,803 in Rantau Layung.

Table 7. 10. Comparison of forest residual values in the research villages.

Input/output Village households	Rantau Layung Hh=45	Pinang Jatus Hh=56	Muluy Hh=22
1. Labour values (Rp.)	293,062,000	382,793,750	127,859,424
2. Cost of capital (Rp.)	30,460,440	29,322,000	9,892,800
3. Capital depreciation (Rp.)	50,767,400	48,870,000	16,488,000
4. Total input (1+2+3) (Rp.)	374,289,840	460,985,750	154,240,224
5. Total output (Rp.)	435,632,000	523,641,000	199,822,000
6. Forest residual (5-4) (Rp.)	61,342,520	62,655,250	45,581,776
7.F.Res./hh/year (6:hh) (Rp.)	1,363,167	1,118,843	2,071,898

This information also offers a possible explanaton regarding the access of villagers to forest resources, in which the households in Muluy spent less time on collecting forest products compared to the villages of Pinang Jatus and Rantau Layung. This can also be explained by the effect of forest richness, which makes the return from forest products collection higher in Muluy than in Pinang Jatus and Rantau Layung forest areas. This information is also an indicator of forest condition, i.e. that forest conditions in Muluy are better than in Pinang Jatus and Rantau Layung because this village is located inside the protection forest area,where timber harvesting is prohibited and the abundance of non-timber products is greater.

One standard method of analysing production within an economy is the Cobb-Douglas model, where the production function is:

$$\log Y = \log A + \alpha \log L + \beta \log K + \ldots \qquad (5.1)$$

where Y = the total output, L = labour inputs, and K =the capital inputs.

Using logged values for the variables, a multiple regression can be run on this to indicate the relatively importance of the various components of the production function (Pindyck

& Rubinfeld 1981). Although this is a vast area of potential investigation, which is beyond the scope of this present research, this procedure can be used to examine some of the factors influencing the various activities which make up the production function in these village economies. To illustrate, a preliminary examination of forest use (in the form of non-timber forest products use) and fishing is include here.

To examine the factors influencing the extent of forest use by households, a regression analysis, such as that described above, has been run, on all the households of the study and on the individual villages.

For the purposes of this preliminary examination, the model tested is:

Value of forest use = f (hunting, rattan, fuel wood, wild honey, food and fruit, labour supply, capital availability, family size, crafts, fish, and palm wine) ***(5.2)***

In this analysis, it has been important to include explanatory variables that are not part of the equations used in the determination of forest values as outlined in section 4. And so, dummy variables are used to indicate simply if a household is involved in, fr example, hunting, rather than using the value of the hunting output as the explanatory variable. The same procedure is applied to rattan harvesting and handicrafts. From this analysis, taking all households together, $R^2 = 0.47$, which indicates that the model can only explain 47 per cent of the variation in the value of forest use. Nevertheless, three of the explanatory variables are statistically significant at the 5 per cent level, suggesting that they do have an effect on how much households are likely to make use of the forest, in terms of their use of non-timber resources. The three significant variables are the number of women in the household, and whether or not the household participates in hunting and handicraft activities. To some extent, this provides statistical support for the priori intuition that these variables would be important to forest households, and are likely to influence the extent to which a household would make use of forest resources.

When some procedure is applied to the individual villages, some differences are revealed. In the village of Pinang Jatus, where the sample is largest with 56 households, $R^2 = 0.37$, again suggesting a rather weak model, but nevertheless indicating that hunting and rattan collection are statistically significant. In the case of Rantau Layung, with 45 households, an R^2 of 0.42 shows that only fuel wood and other NTFPs are a significant explanatory variable. This is also the case in Muluy, although in this village, where there are only 22 households, $R^2 = 0.62$. One thing revealed by this analysis is the importance of rattan in all of these villages, and the fact that in Pinang Jatus handicrafts are more important as a livelihood strategy than in the other villages. In addition, the role of women as users of forest resources is highlighted as a significant variable. Although these figures are not definitive, and the model itself can be improved, this analysis does indicate that the type of data collected in this research may be used by those who wish to apply econometric techniques to understand the underlying processes in economies such as these.

In terms of the fishing output, the model examined investigates the relationship:

Value of fishing = f (crop values, hunting, rattan, handicraft, capitals, and labour availability, family size and location) ***(5.3.)***

In this case R^2 = 0.62 for the 123 households combined, with participation in hunting being a significant explanatory variable, along with the household labour supply, and the number of children to feed. A further variable revealed in this regression is that the dummy for the village of Muluy is negatively significant at the 5 per cent level. This confirms the fact that in Muluy, there is less likelihood that households will participate in fishing as an activity, mainly as there is no major river flowing through the village.

When examined independently, each village produces different results. In the case of Muluy, participation in hunting is the only significant explanatory variable, with R^2 = 0.37, while in Rantau Layung, R^2= 0.65, indicating a better fit with family size appearing as a significant variable, along with a negatively significant value for capital availability. This latter point seems to confirm that in this village, particularly the value of fishing does not depend on a household having access to high levels of capital availability. This is something that was indicated in the other villages, but was not statistically significant. Another interesting difference between the villages was revealed by the fact that in Rantau Layung, the only significant explanatory variable is a negative one, relating to the value of crop output. This suggests that in this village it may be that households that have poorer farms become more involved in fishing.

The attempt to analyse the data from these villages using standard econometric techniques demonstrates how different livelihood options may be adopted by different households. An interesting area for further research is to try to improve on the model used in this type of analysis, and to try to identify more accurately what determines the various preferences that householders have for the utilisation of their time.

7.9. Conclusion

It is clear from the above analysis that the findings of this study reflect a picture of subsistence forest livelihoods that depend heavily on the utilisation of forest products and services. The villages in this study provide a sample of households that reflects different preferences for a variety of income generating activities. The analysis suggests that labour availability, market conditions and geographical variables are the main factors influencing the decisions about land use and survival strategies made by these people.

While individual differences between households have been revealed, it is clear from the comparisons made here that a degree of overall homogeneity of households does exist. This suggests that findings from this study have possible application in similar forest households elsewhere. Policy implications arising from these findings are to be examined later. In the next chapter, the policy and social dimension of forest values will be explored.

Chapter 8

Non-economic dimensions of NTFP use

8.1 Introduction

This chapter discusses the social and cultural dimensions of non-timber forest products (NTFPs) in the research area. This is a crucial aspect of any analysis of tropical forest use. As has been shown in the previous chapters, there is no doubt that NTFPs play a significant role in the economy of Paser people, but their importance goes well beyond the economic sphere. In an attempt to include this non-economic dimension, qualitative information on people's perceptions of a number of issues was collected from all participating households. This chapter begins with a review of the literature on social and cultural dimensions of NTFP in section 2 and is followed by an analysis of people's perceptions of the local conditions influencing the use of NTFPs in Section 3. The following analysis provides an heuristic insight into social, cultural and political dimensions, and these are included here as a means of broadening the concept of economic value and to highlight another dimension of value, as perceived by the forest dwelling people of the Gunung Lumut Protection Forest.

8.2 Social and cultural dimensions: A review

Literature on non-economic environmental values ranges across a whole spectrum of disciplines, most notably philosophy, anthropology, ethnography, linguistics, psychology and political science. Even within the economic disciplines, interest in such issues is growing, in the field of economic environmental valuation itself, and especially within the realm of ecological economics. As Knetsch (1994) puts it, referring to the question of valuation, there is much need for 'a greater willingness to explore alternatives to current practices'. While the extent and breadth of this literature warrants a study in its own right, it is inappropriate to attempt this here, so only a sample will be reviewed.

In traditional societies throughout the world, important beliefs and cultural heritage, often with deeply rooted ecological significance, are passed on from one generation to another in the form of myths and legends. A number of studies in Southeast Asia have recorded local myths and legends. It is well known that forests have important spiritual, religious, political and social values for a number of Southeast Asian tribes (Posey 1999; Gonner 2002; De Beer 1997; Persoon et al. 2004; Matius 2004; Schefold 1995; Slikkerveer 1999). Individual trees, plants, and forest groves may hold a special function, such as being associated with the transfer of moral values from one generation to the next. Certain species of plants and animals are also used to mark property rights, or to provide important emergency resources in times of difficulty, while others are used to provide materials for making hunting equipment or tools for sacred rituals. In a situation of curious duality, it is often the case that these plants and groves are also believed to have harmful power, which can be of great use to evil spirits (Semok. personal communication, 2005).

There is a close-knit association between cosmovision – how the relationship between man and nature in its widest sense is perceived – and agricultural practices. Traditional knowledge often implies that rites, practices and customs are continued out of sheer habit, or out of an undefined fear of bad influences if they are abolished (Slikkerveer 1999). These all explain that the forest or the jungle is much more than just a source of forest products (Schefold 2002).

The social and spiritual importance of forests and their resources in Borneo is well documented by many researchers. In particular, the work of Weinstock (1983) and Gonner (2003) is of great importance for East Kalimantan. Much of their work provides a detailed and sensitive insight into the diverse and complex cultural mix that makes up this region, and the importance of forests and their products for the local people. There is extensive literature on cultural values and beliefs in the central and the northern parts of Borneo. Today, there is also an interest in this knowledge and beliefs in relation to the question of the intellectual property rights of indigenous forest people. Examples of this are found in the extensive writings of anthropologists such as Colfer (1997), Posey (1995) and Dove (1985). The importance of this knowledge for biodiversity conservation has been highlighted by ecologists such as Matius (2004), Valkenburg (1997), De Iongh (2003), Kusters and Belcher (2004) and Puri (2004).

Weinstock (1983) has reported on the rituals among the Dayak of East Kalimantan. He describes the three major types of life rituals of the Dayak Luangan (sub-tribe of Dayak). These are: curing *balian* (*belian*), thanksgiving (*balian*) and *family rituals*. Gonner (2002) also reported similar rituals, called *Belian* and with *pembeliatns* playing an important role, found among the Dayak Benuaq. *Pembeliatns* are mediators (male or female) between the human and the spiritual sphere who, among other things, look for the cause of disease in a patient and conduct rites in order to bring back the vital soul or to exorcise it in cases of possession. All these processes are accompanied by the use of many varieties of plants and body parts of animals, as well as traditional dancing and songs (Hopes *et al.* 1997; Gonner 2002).

Figure 8. 1. Celebrating rice harvesting in the village of Rantau Layung (2006).

Within the legal profession, the question of environmental valuation and non-monetary valuations is of interest to those involved with legal disputes concerning environmental damage, such as cases involving logging. From a legal perspective, incidents of ecosystem damage result in both emotional injury to those who live there, as well as possible deprivation of their property rights (Sardjono 2007; Baker 1995). This is certainly the case in East Kalimantan where indigenous peoples are experiencing the reduced potential of timber. This highlights the need for more research on the question of how to assess non-monetary aspects of environmental value more effectively. More specific psychological and sociological analysis of environmental values and beliefs have been the focus of work by Dietz and Stern, and these researchers, among others, have tried to identify the roots and causes of such beliefs (Stern & Dietz 1994). In this work, the authors suggest that the biospheric value orientation, discussed in theoretical literature in psychology, is linked to social altruism, and may be subject to the influence of socio-economic variables and gender. They have also demonstrated (Stern *et al.* 1995) that generalised beliefs and behavioural intentions about human-environment interaction can be measured by a variety of socio-metric techniques, including specific attitude rating scales, such as the *New ecological paradigm* and *Awareness of consequences tests.*

Questions relating to the relationship between philosophy, ethics, environmental values and management have been raised by Norton (1995), who points out that, even after twenty years of debate, no consensus has been reached on what constitutes inherent value in nature. He goes on to say: 'Nor have environmental ethics been able to offer useful practical advice by providing clear management directives regarding difficult and controversial problems in environmental planning'.

The problems associated with attempts to value environmental functions have been discussed at length within the ecological economics literature, and this very controversial area has generated much debate. In response to a publication on the value of ecosystem services (Costanza et al. 1997), a number of authors have suggested certain issues to be addressed. For example, Opschoor (1998) highlights the need to consider the views of all stakeholders in attempting the value ecosystems, while Hueting et al.(1998) point out that the Total Economic Value of functions is much more than the sum of producer and consumer values, as argued in conventional environmental economics literature. In the same discussion, Turner et al. (1998) draw attention to the many pitfalls associated with such attempts at valuation, and they argue that the case for more research into questions related to socio-economic choices and their environmental impacts.

Overall, this small sample of the literature concerning non-monetary valuations of environmental resources confirms the need for broadening of perspectives, to enable us to take more account of the reciprocal nature of the links between human action and environmental quality. It is with this in mind, that these issues of the social values of forest use are presented here.

8.3 Local framework conditions influencing the NTFP use

The need for analysis of the importance of non-monetary valuation has been discussed in Chapter 2 and the section above, and one of the ways that this may be assessed in the present research context is demonstrated here.

8.3.1 Methodology

In order to collect data on these broader social, cultural and political values, a number of questions on the subject were posed to men and women in all participating households in the three study villages. Examples of the types of questions asked are shown in Box 8.1 below, and examples of all data sheets used in the study are given in the Appendix.

As with the quantitative data collected, these questions were asked during structured interviews, conducted by researchers and field assistants in the homes of the respondents, and an attempt was made to collect this information in an informal way, ensuring that all views were represented. For consistency, responses were recorded on pre-prepared data sheets, and for the purpose of analysis, these were classified into categories of response.

Figure 8. 2. The method of assigning people's response to development issues.

Box 8.1 An example of a prepared data sheet for responses to questions of contentment

CONTENTMENT (key questions)

- What would you like to change in the village?
- What would most improve your life?
- Do you think life will be easier or harder if the logging concession would leave out of the village?
- Can you explain the role of rural government program in your village?
- What are the most important things that changed your village in the last 10 years?

Four basic issues were addressed by the qualitative data collected. These dealt with opinions about contentment and life in the forest, future development options, environmental quality, and the importance of forest functions. In the case of questions about possible development options, and about the importance of forest functions, respondents were asked to score each attribute from 1 to 5. This was done to ensure that all participants were able to indicate what value they wished to assign. The use of such counters enabled the data collected to be classified as interval data, thus making it amenable to parametric testing. In addition to the data collected from senior men and women in all households, other responses to these questions were also collected from village elders, to allow some intergenerational comparisons.

8.3.2 Methods of analysis

In this attempt to capture the social dimension of forest values, three types of qualitative information were gathered. Nominal data – relating to how life is influenced by the forest – and ordinal data – such as those relating to perceptions of environmental change – were collected from all occupied households. In addition, interval data were used to assess the attitudes of both men and women on development options and on the importance of various forest functions, where scores 1 to 5 were assigned. In order to evaluate the information statistically, this raw data is summarised in the tables, and appropriate analytical techniques are then applied. Various techniques could be used to test this type of data, including regression analysis, chi squares and analysis of variance (Downie & Health 1970). Given that this is a preliminary investigation of these social values, evaluation of these data is limited here in responses, with analysis of variance being the main method used to identify the sources of variance, and t-tests used to test these for significance. The use of statistical analysis in this section is aimed to complement the qualitative information of socio-cultural and political dimensions of NTFP use in the villages study.

8.4 Perceptions on the role of forest and environment

Generally, there is an a priori assumption that people who live in forest environments will feel some affinity with the forest as an entity, resulting in some implicit measure of value placed upon it. While it is impossible to estimate this in the conventional economic sense, it is important to try to understand more about it. One way of doing this is to examine how forest dwelling people perceive their environment, and how they feel about living inside the forest. It is with this in mind that questions on such issues have been included in this study. The answers to these questions have produced a body of discontinuous data – partly nominal and partly based on dichotomous choices (yes/no). Such data does not lend itself to powerful statistical analysis, and so in these cases responses are simply displayed as percentages in each group, as shown in Appendix 13. From this table it can be seen that 90 per cent of men in Pinang Jatus think that the forest is generally important for their families; in Rantau Layung the corresponding figure is even higher at 95.7 per cent, but in Muluy it is somewhat lower at 89 per cent. For women in Pinang Jatus, 95 per cen feel that the forest is important, while in Rantau Layung the figure is 93.3 per cent and in Muluy, only 89.1 per cent of women feel that way.

For all men and women interviewed, plants from the forest are considered essential to life. This is true in the sense that, in order to make mats, baskets or other objects of rattan, and to eat wild food plants such as sago starch, and the use of various plants for vegetables, a productive forest is essential.

From these interviews it can be summarised that forestry activities are considered to be a necessary part of Paser people's livelihood and it is not without reason that they are perceived as being 'forest farmers'. Collection of NTFPs for commercial purposes is crucial for the livelihood of this community 'who know the forest better'. Exceptions are young Paser men who, for example, participate in gold-rush type activities such as the search for *gaharu* or eaglewood far from home. The experience, adventure and thrilling hopes for sudden wealth seem even more important than the actual chances of generating a relevant income. This is the modern answer to a tradition known as *pelesai*, where inland people went to companies and cities along the Kalimantan highways, looking for adventure, wealth and modern industrial goods.

8.4.1 Rights to resources

National policies on forest management have a tendency to deprive local people of legal and practical access to forest and forest products (see also Persoon et al. 2004). National land use allocation and the protection of the Gunung Lumut forest and plantation estates generally disregards local communities (Bakker 2006) and their demand and traditional rights for adequate conservation of NTFPsand forested land (Pema, personal communication, 2005). Joint land use planning and consecutive arrangements between investors and local communities were made after decentralisation in 2000, and depend heavily on the good will of the companies (Jusuf, personal communication, 2006).

Forest products that generate high profit margins have been officially taken out of the hands of indigenous people. The official arguments to do so include better and controlled management and increased national income from a licensing system, levies and income taxes. The predominant examples in East Kalimantan are the timber trade and the harvesting of edible birds' nests. Similar attempts to regulate rattan collection in natural forests have failed due to falling prices, current low profits per area, and the fact that most commercial rattan is already produced in smallholder rattan plantations.

Though management regulations have increased and levies are being collected by the forestry administration, the legal income possibilities of local people have decreased. At the same time, traditional harvesting regulations have become groundless, while 'modern' management control is insufficient. Short term high expenditures by current investors and continued but now unregulated and illegal harvesting by local people, in addition to migrants, lead to rapid depletion of resources.

In Chapter 4 it was shown that Paser indigenous people belongs to the sub-ethnic group of Dayak. The Dayak consists of 14 sub-ethnic groups, one of which is the Luangan. The Dayak community mainly occupied the hinterland and the border areas of Malaysia and Indonesia in Borneo (Weinstock 1983). Paser people belong to the sub-group of the Luangan, who belong to the Barito language family (together with the

Ngaju, the Ot Danum and the Ma'anyan) (Silander 1995; Ave 1972 in Gonner 2003). Weinstock (1983) further divides the Luangan into 14 subgroups: Tunjung (Tonyoi), Pahu, Benuag, Bentian, Purei, Taboyan (Tiwoian), Bawo, Pake Kerau (Lawangan), Malang, Bayan, Dusun Tengah, Dusun Wito, Dusun Dayeh, and Pasir.

As in many other areas of Borneo, ethnicity and the concept of belonging to a specific tribal group (above village or watershed level) are not well developed among Paser people. Similar to the ethnonyms Iban, Land Dayak, or Ngaju, the name Paser was never used locally in the sense in which it had been used by ethnographers in the past (Gonner 2003; UNHAS 2003). It is therefore more a concept that organises indigenous groups along a cultural and linguistic scale in order to stress socio-cultural differences (although there is always some kind of overlap).

The term *Paser* is sometime confused with *Pasir*. *Paser* relates to the ethnicity of a sub-group of Dayak in the region of the Gunung Lumut, and *Pasir* refers to the district name or the official government administration. These two terms are sometimes even confused by the people in this region. In response to the euphoria of autonomy, the government of Pasir changed the name of the district from Kabupaten *Pasir* to Kabupaten *Paser* in August 2007.

The government's recognition of the Paser entity, by introducing the nameKabupaten *Paser*, was expected at the initial stage of the process of accepting indigenous people's rights to resources. However, it has not been achieved, not least because these processes take a long time and the presence of district policymakers is quite low. An example of this is found in the case stipulating the *Hak Adat and Ulayat* of Paser indigenous people in the local regulation (*PERDA*) in 2005. The District Head (*Bupati*) of Pasir agreed to issue *Peraturan Daerah or PERDA*, which stipulates the traditional norms and rights to resources. However, it was not implemented because of pressure by parliament members who were worried about the consequences of these new regulations, including increased claims by indigenous Paser people for lands already in use as oil palm plantations.

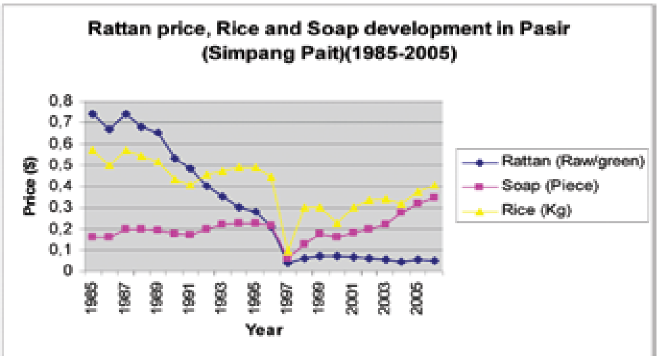
The policymakers in Pasir District were much more aware of the consequences of stipulating indigenous people rights in *PERDA* for the industrial or big companies than for the indigenous people. This could be another reason why the government programme for rural areas was never fully implemented.

This lack of recognition of the Paser indigenous people's rights to natural resources has increased the concerns of these people about their livelihoods, not just in the present, but also in the future. A clear negative impact of this is the limitation of the rights to collect wild honey in the logging concession areas and the tax that has to be paid for selling rattan harvested from small-scale rattan gardens. According to the informants, there are many wild honey trees in logging concessions areas belonging to them but they cannot be harvested or maintained because the concessionaires do not allow them to enter the area where honey trees are located. Some concessions holders deny this, but say that they are afraid that people want to conduct illegal logging inside their concession areas, while other concession holders admit that it is true that they do not allow people from the village to enter their logging concession area because, they say, the local people already have their own forest. When they were asked about the wild honey trees in their concession area that belong to the indigenous people, it became clear from their answers that the concession holders are not well informed about the rights of the indigenous people with respect to wild honey trees. The logging concession holders are under the impression that indigenous people's rights to resources and forest products in the concession area have been abolished by the granting of the concession to the logging company.

The loss of access to wild honey in the logging concession area has reduced the potential benefits of the forest for Paser indigenous people. The logging operation in the nearby village area has also reduced the potential harvesting of wild honey outside the logging concession areas (Semok & Lawut, personal communication, 2005). This is because of the damage done to the forest. There are less flowers inside the forest from which the bees can collect the nectar. This is particularly the case for flowers from important timber species like Shorea and Dipterocarp trees. This situation is deteriorating further now that staff of logging companies are collecting the honey themselves, without taking care of its sustainability. It is argued that one of the reasons that this happens is because the company's workers are not recruited from the indigenous population.

A similar pattern exists for rattan production. Chapter 5 has already explained that most of the rattan canes produced in this region come from small-scale rattan gardens. However, the government perceives this harvest as originating from natural forests, which requires a licence or certificate and also permits the transportation and marketing of rattan. There is also an obligation for the collector to pay a resource tax, which is paid according to species and the volume of rattan transported. The use of a certificate or a licence to trade rattan from the village to the factory gates has made rattan transportation more expensive. The costs associated with rattan transportation are paid by the farmers through a reduction in the purchasing price at the village gate. In other words, the buyers are shifting the costs of handling, transporting and paying tax on rattan canes to the farmers, even though the benefits gained by the farmers are much lower compared to those obtained by the traders.

Figure 8.3 below provides details of rattan price reductions in the last 20 years, from US$ 0.8 per kg in 1986 to just US$ 0.06 in 2007. This price is not sufficient to support the development of new rattan gardens or even to maintain existing ones, as the benefits of rattan cultivation are less than those obtained from other agricultural crops, like palm oil.



Source: Saragih 2007

Figure 8. 3. Rattan price, Rice and Soap development in Pasir (Simpang Parit) (1985-2005).

The inclusion of rattan as a natural product in the government regulations not only reduces the price of rattan at the village gate level, but also the benefits obtained by the farmers. Ultimately, this triggers the conversion of rattan gardens to other agricultural products, like palm oil, rubber and rice. This has led to a serious depletion in the rattan resources and the biodiversity in rattan gardens. In contrast with single crop plantations, rattan gardens are rich with natural trees and they have a potential for the biodiversity conservation (Matius 2004).

From the analysis above it can be concluded that a lack of appreciation for indigenous people's rights to resources will have a serious impact, not only on the indigenous people's economy, but also on resource sustainability. The findings of my study in this region clearly show that Paser indigenous people's rights to honey procurement and to rattan harvesting are the most prominent issues raised by the indigenous people during the field data collection.

8.4.2 Paser people's perceptions about future development

In spite of their subsistence lifestyle, more and more Paser people are involved in cash generating activities. In some instances this occurs in addition to subsistence farming, but for others it has also become a substitute for more traditional activities. This diminishes previously reciprocal participation in the traditional share-and-barter society. The historical 'give and take' by money earning individuals and households seems to be increasingly substituted for cash payments. Rapid regional development in road infrastructure, oil palm plantations and timber estates have a big impact on social interactions in so far as it broadens the choice of income generating activities. Inter-regional trade and mobility are facilitated by constantly improving commercial transport facilities. NTFP collection and processing as a source of income now have to compete with timber production, wage labour, employment and sales of cash and subsistence farm crops.

The interviews revealed that the majority of people living in these villages consider themselves to be 'happy', with the responses of the men and women of Rantau Layung being the most positive. However, in all villages, a higher proportion of women say they are happy compared to men. Some variation exists in people's attitudes towards the future of life in the village, as indicated by their responses to questions concerning their views about their children. In general, men seem to want the children to stay in the village much more than women do, with 85 per cent of men in Muluy expressing this view, but only 61 per cent in Pinang Jatus. When asked about prospects for the future, the majority of both men and women in all villages felt that the future is likely to be easier than the present, with scores for this question ranging from 57 per cent to 65 per cent. This also indicates that a sizeable proportion of all villagers are not so optimistic about the future. Similarly, when questioned about improvements to their lives, the responses were varied. For example, 51 per cent of both men and women in Pinang Jatus felt their lives would be improved by a job or more money, while only 24 per cent of men in Rantau Layung and 32 per cent of women in Muluy felt this way.

If we look at the lifestyle of a subsistent farmer, it is not unreasonable to find respondents (men and women) who say they are happy. Having stored enough rice for consumption for a whole year would be reason enough to say that he/she is 'happy', in the sense that there is no serious problem with food. This perception was found among all older villagers, both men and women. Those male respondents who said they were unhappy were mainly found in the younger generations, among people already used to having cash and who tend to participate in cash generating activities. In particular, when we asked about the abolition of small-scale logging in the village, the young generations reported that they were not happy at all with current government policies.

When asked what they thought they would most like to change in the village, responses were quite varied, and these are shown in Appendix 13. From this, it can be seen that for men, most improvements in life in the village would arise from an improvement in the standard of living, better transport and better sources of cash income. In addition to these changes, more women than men would also like to see better healthcare facilities, more shops or businesses for handicrafts, and other lifestyle opportunities for young women. If we compare these with the responses about ultural change, more women than men would like nothing to change in their village. This implies that the maintenance of a traditional lifestyle is perhaps more important to some women than to men.

How people feel about improvements in their own personal lives is shown in Appendix 13. While this has rarely been examined within Paser communities, it may have important policy implications. From this data and analysis, it is interesting to note that when questioned about improving their own lives, the issue of better education and the availability of more cash are mentioned more frequently by men than by women; while more women than men suggest improvements such as a better handicrafts market, better health and getting a job. These possible gender differences highlight the importance of using participatory methods of data collection in order to enable a range of views to be included in the decision-making process. These perceptions may influence what people would like to happen in the process of development, and so people's views for a number of development options have been examined in more detail in the next section.

When the villagers were asked about issues relating to the future development of their village, the responses are quite surprising. They have mixed feelings, and this could be as a result of their experiences in the past. Some people see 'development' as an opportunity to improve their own standard of living, while others associate it with the extraction of natural resources, without benefits for local people; this increases their concerns about the future. Their concerns relate to the insecurity of the forest, access to products and the insecurity of future market development.

The insecurity of future market development was a major issue raised by the respondents when discussing NTFPs and, in particular, rattan. The market for rattan in the past has proven un stable and the price has decreased, because of local resource depletion, the low quality of products and also because of the obligation to use a license for transportation (see section 8.4.1 above).

It is not without reason that many households have already converted their rattan gardens to other agriculture crops. This conversion might well happen without full calculation of the possible impact on the household and environment. The decision was often made on the basis of the idea that the opportunity costs of making or maintaining rattan gardens are less advantageous than for oil palm or rubber. It is found that the majority of respondents believe that rattan is no longer the promising crop that it was fifteen or twenty years ago. This feeling is supported by the results of this study, which show that the price of rattan has not improved since the last 15 years. For some households it is the right time to make a decision to shift to another crop.

Surprisingly, our findings reveal that the returns on investment in small-scale rattan cultivation are less attractive when compared with palm oil, but positive compared with a rubber plantation. Most likely, the conversion of rattan gardens into oil palm plantation will generate more income. Table 8.2 below indicates that the Net Benefit Cost Ratio (BCR) of a rattan garden is 1.62. It is less attractive when compared with palm oil, which has a BCR of 1.76. The Internal Rate of Return (IRR) of rattan is 18.17 per cent and this rate is higher than rubber (13.26 per cent) but lower than oil palm (20.52 per cent).

Table 8. 1. Economic profitability of rattan segah, rubber and oil palm cultivation in Pasir (per ha.)

Investment Criteria	Return of Investment (interest rate 15%)		
Period of investment	Rattan garden	Rubber	Oil palm
	40 years	40 years	35 Years
Net B/C Ratio	1.62	1.05	1.76
Net Present Value	5,402	542,035	9,039
Internal Rate of Return	18.17%	13.26%	20,52%

Notes: The payback period of rattan is eight years and for oil palm is seven years.
Source: Saragih 2007

Indigenous people in the research area have never been informed about the returns on investment in exogenous land use systems (rubber and oil palm). However, this does not mean that they have made a bad decision by converting their forest or rattan gardens. The return on investment, as shown in table 8.2 above, makes it clear that the conversion of rattan gardens by the indigenous people of Paser is financially feasible, but again, the value of a rattan garden is not only to be seen in financial terms. There are many other values of rattan gardens besides a source of cash income; one of the better known is their role in biodiversity conservation (see also Matius 2003; Godoy 1986; Valkenburg 1997).

8.4.3 Paser's social ties and kinship

Like all other Dayak Groups in Borneo (King 1994), the Paser are a cognate society, in which the kinship nomenclature is bilaterally symmetrical between the father's and the mother's side. Inheritance is bilineal from mothers to daughters, and from fathers to sons, In the case of land, males and females have equalrights.

In general, an individual person perceives his or her kinship in a kindred-like way, although the Paser have no equivalent expression for kindred. Lateral family ties are counted up to third cousins – first cousin (*warsato*), second cousin (*warduo*), and third cousin (*wartolu*). Fourth cousins are usually not regarded as family in cases of shame or conflicts.

Traditionally, young married couples had to live for between three and six years in the place of the bride's parents, depending on the parents' demand for assistance and the readiness of the couples to be independent. After this period, the couple had to return to the husband's family for the same period, before they were allowed to choose a domestic location of their own. If the couple did not return to the husband's family they had to pay an adat fine. Nonetheless, I have never found any evidence of this second rule (i.e. to return to the virile local place) being enforced. In fact, even the Rantau Layung's *kepala adat* himself followed his wives to their villages twice, without returning to his parents' place. Due to this de facto uxorical pattern, the parent in-law of a man plays an important social role. In Rantau Layung, the most predominant pattern in collective swiddens was the combination of sons-in-law with their wives' families, and the authority of a father-in-law must be respected more than that of a man's own father.

Although marriage prescriptions are less strict today, in 17 out of 22 recent cases the husband still followed his wife, while there was a 5:2 ratio of village exogamy against endogamy. In 17 cases the respective spouse (12 men, 5 women) married into Rantau Layung, in 7 cases they married out of Rantau Layung, and in 10 cases couples married within the village. Traditionally, marriages between cross-cousins (marriage of the mother-brother's daughter) of any degree were regarded as favourable, while parallel cousin (marriage of the father-sister's daughter) marriages were regarded as *pamali* or taboo.

An even more severe adat offence is the marriage of partners from different genealogical levels. Counting from a common ancestor, one partner might belong to a different generation although both are of similar age. Such a case would be regarded as an incestuous marriage, for example, between father (mother) and daughter (son) or uncle (aunt) and niece (nephew). It would have to be purified with a *ngelas adat* or cure ceremony. Semok (the *kepala adat* of Rantau Layung) says that the mythological rationale for this cultural habit is similar to that found in Benuaq *Temputn Sahuq Sumakng* (Hopes et al. 1997).

King (1994) mentioned that in most Bornean societies the largest percentage of households can be categorised as nuclear or stem families. This definition also fits the Indonesian administrative view that regards married couples with their children as families (*keluarga*) and households (counted as *kepala keluarga*). However, the 'household' is not necessarily synonymous with the domestic unit, as 45 households shared 37 domestic units (individual houses or family) in Rantau Layung. In several cases, the domestic units inhabited by external families, generally include three generations and, thus, constitute several households. While food is often shared between the households of a domestic unit, financial income is usually managed individually by each nuclear family.

Hence, the household appears to be the relevant unit in terms of resource and capital allocation, although there is a close cooperation that extends floatingly along kinship lines. On a larger scale the predominant social organisation in Rantau Layung and Pinang Jatus is kinship, with a strong relationship between parents and their children, as well as with the core family, including other close family members.

The net links between 45 nuclear families in Rantau Layung are directly related to one another. There is only one exceptional family in Rantau Layung, which is not linked with the net because this family comes from another region. The head of this household was appointed as *Dai Pembangunan* or Muslim teacher by the government.

Although intra-village conflicts are said to be motivated individually or by cross-family ties, even at the family level, the core of a fluctuating group that usually opposes the village chief and his followers is constituted by two households without direct links to the village chief's families or the net. These observations stress the great importance of close family members, while the kindred level (defined locally as the *wartolu* level) covers the whole community of Rantau Layung due to the dense web created by marriages. Apart from marriages, many other social aspects are regulated by traditional adat law. This unwritten law is handed down from one generation to the next and supervised by the traditional village chief (*kepala adat*) and is acknowledged by the elders (also from other villages). Cases of violations of adat law are usually discussed in a meeting (*berinok* or *berembug*), often including many people who function as witnesses (Ind. *saksi*), or who contribute their comments until a consensus is found. Financial fines and ritual payments are imposed in terms of the adat currency with *lampokg* (a little pot) being the smallest unit, valued at Rp. 15,000. This is followed by *Jogo* (a white plate) valued at Rp. 50,000; *antang* (large Chinese jar) valued Rp. 75,000; and gong (a bronze gong) valued at Rp. 150,000.

Land tenure is also regulated under adat law. There are two modes of land tenure among the Paser: (1) circulating usufruct systems, and (2) *devolvable* usufruct systems. In the first case, no permanent usufruct is acquired by the clearing of primary forest, and everyone has the same right to use a fallow forest originally cleared by others. Examples of this mode are found in the *Awa Uma* and *Pangeramu* (see Chapter 5 on traditional land arrangements) of Rantau Layung, where households can make new *ladang* or dry rice fields in the former rice growing area of neighbouring or other villagers. The second example is the rattan garden, this is a property of a family that has planted rattan seedlings in the land and then handed the land over to their children.

Tenure rights are derived from the clearing of a piece of primary forest and extended to the further use of the subsequent fallow, including the establishment of forest gardens. These gardens are later divided among the children, including those who have permanently left the village. If other people establish gardens on these respective fallows, land tenure remains with the primary owner, while the usufruct (Ind. *hak pakai*) of the planted crops belongs to the new farmer.

8.5 Attitudes towards the forest and environmental changes

Paser people's (men and women) views on various development issues in the villages are shown in Appendices 14a, b and c. These tables indicate the mean scores assigned to each issue by all respondents (representing 100 per cent of occupied household), and their standard deviations. This suggests that some variation exists in how such issues influence their own families and the community and the indication of how such issues influence their children's lives. From these tables, it is clear that Paser people (men and women) have various views on various development issues in the villages.

The preliminary examination of these data, with an analysis of variance, reveals the source of variation in attitudes between men and women to the development issues and allows the most important of these to be identified by conducting the t-test.

These tests are used to test the null hypothesis of no differences in the means between the various groups, and where significant differences are found, this hypothesis can be rejected. In cases where the null hypothesis is rejected, it suggests that since the means of the groups are different, attitudes from one group cannot necessarily be assumed to be the same for another. This also suggests that there may be both exogenous variables (e.g. geographical factors) and endogenous variables (e.g. the nature of the villagers themselves and tribal affiliation), which may be the cause of this variation. As a preliminary investigation, these can be further examined by an analysis of variance, the results of which are summarised in table 8.3 below.

On the basis of this analysis, it can be seen that there is a statistically significant difference in the variances in both the rows and columns of the raw data between men and women. This implies that both within the villages, and between the villages, there does seem to be some significant variation in people's ideas about alternative development options. The sources of variance are examined further below.

Table 8. 2. A summary of results from the analysis of variance of men's and women's responses to questions on development issues.

ANOVA results of responses on development options from all men and women						
Source Of Variation	Sum Of Squares	Degrees Of Freedom	Mean Square	F-Value	P –Value	Critical Value Of F
MEN						
Rows	564.30	121.00	4.66			
Columns	801.07	17.00	47.12	**4.99**	0.00	1.23
Error	1924.32	2057.00	0.94	**50.37**	0.00	1.63
Total	3289.68	2195.00				
WOMEN						
Rows	856.01	121.00	7.07	**7.69**	0.00	1.23
Columns	553.33	17.00	32.55	**35.36**	0.00	1.63
Error	1893.39	2057.00	0.92			
Total	3302.73	2195.00				

8.5.1 Attitude differences between villages

Village comparisons can be made using a variety of advanced statistical methods, such as ordered probits, but even simpler tests of significance allow some investigation of the degree of similarity or difference between the villages on specific items.

On the basis of the results from the analysis of variance shown in table 8.3, attitudes to nature and the environment, business development and tourism seem to be the cause of some variation between the tested groups, and so these three items are further examined by t-tests. Firstly, these variables were tested for all men, irrespective of villages of residence, and the responses given to the impact of these on the family, community and the children's lives are all examined. Results of this are shown in table 8.4, displaying the probabilities associated with the relevant t-values for each item. Scores which are significant at the 5 per cent level or below are shown in bold.

These figures indicate that, in relation to the importance of nature and the environment, there is a significant difference (at the 5 per cent level or less) between the means of men's responses when considering the case of the family, compared with the community at large. Referring back to the data in Appendices 8.2a, b and c in, it can be seen that, taken across all villages, this issue does seem to be more important for the community rather than the family. Significant differences also exist between the means of their responses concerning tourism, with responses relating to their family being significantly different (lower, as can be seen in table 8.2.) than the importance of this to both the community at large and their children's lives (the future).

Table 8. 3. Probabilities associated with all men's responses on selected development items in relation to the family, the community, and the children's lives.

Compared responses	Nature and environment	Business development	Tourism
Family now and community now	**0.037**	0.164	**0.045**
Family now and children's lives	0.111	0.061	**0.005**
Community now and children's lives	0.655	0.610	0.426

This procedure was then repeated for the responses from women, and these results are shown in table 8.4. It is obvious that for women's responses, when taking the group as a whole (122 cases), t-tests confirm that for these items there is no significant difference in the means between the groups, at the 5 per cent level or less.

Table 8. 4. Probabilities associated with all women's responses on selected development items in relation to the family, the community, and the children's lives.

Compared responses	Nature and environment	Business development	Tourism
Family now and community now	0.444	0.275	0.215
Family now and children's lives	0.742	0.385	0.444
Community now and children's lives	0.643	0.812	0.623

This implies that women's responses to the importance of these development issues in relation to the various levels of society (family, community, children's lives), are relatively homogenous, although the analysis of variance results did indicate that there were some significant levels of variation in women's responses to those issues.

To investigate these further, differences between the women in the individual villages can be tested for significance using t-tests, as described above. The same procedure is applied to men, and the results of this are summarised in tables 8.4a and 8.4b.

The information shown below clarifies from where the variance in responses possibly originates. For example, it is clear that there is a significant difference in responses for women in Pinang Jatus and Muluy on almost all issues, while a comparison of Rantau Layung with Muluy shows that there are a number of issues, notably business development and tourism, where there is a significant difference between the two groups.

When comparing Rantau Layung and Pinang Jatus, women's attitudes on the importance of nature and the environment at all levels of society (family, community, future) are significantly different. From tables 8.5a, b and c below, it can be seen that women in Pinang Jatus give a lower level of importance to nature and environment than they do in the other villages.

Table 8. 5. Village differences in probabilities associated with men's responses on selected development items in relation to the family, the community, and the children's lives.

Compared Responses	Family			Community			Children's lives		
MEN	Nature & environment	Business Development	Tourism	Nature & environment	Business Development	Tourism	Nature & Environment	Business Development	Tourism
Pinang Jatus and R.Layung	**0.462**	**0.045**	0.595	0.055	**0.045**	0.736	0.109	0.200	0.669
Pinang Jatus And Muluy	0.824	0.336	0.1 16	0.425	0.336	0.201	0.405	0.072	0.356
Rantau Layung and Muluy	0.245	**0.000**	0.267	0.090	**0.000**	0.079	0.285	**0.000**	0.648

By comparing tables 8.5. and 8.6, however, it can be seen that while these differences are significant for women, no significant differences exist in men's assessments of importance of nature and environment. This suggests that men's views on the importance of nature are more likely to be homogenous across the general population, than is the case for women.

From this preliminary investigation, it appears that some gender differences do exist in people's attitudes to development issues, and to examine these differences explicitly further series of t-tests has been performed, as explained in the next section.

Table 8. 6. Village differences in probabilities associated with women's responses to selected development items in relation to the family, the community, and children's lives.

Compared Responses	Family			Community			Children's lives		
WOMEN	Nature & environment	Business Development	Tourism	Nature & environment	Business Development	Tourism	Nature & Environment	Business Development	Tourism
Pinang Jatus and Muluy	**0.000**	0.051	0.007	0.000	0.010	0.001	**0.001**	0.139	0.061
Pinang Jatus and Rantau Layung	**0.001**	0.293	0.813	0.000	0.179	0.280	**0.006**	0.729	0.720
Rantau Layung and Muluy	0.066	0.010	0.000	0.120	**0.001**	0.000	0.090	**0.000**	**0.000**

8.5.2 Gender differences in attitudes to alternative development options

When questioned about possible changes in the future, men and women express differing attitudes to what they would like to see. Since the results from section 8 suggest that the most variable items were tourism, nature and the environment, and business development, gender differences in these were further investigated by testing for significance using t-tests, which compare all men's responses with those of all women. Results of this comparison between men's and women's responses are displayed in table 8.7 below.

Table 8. 7. Probabilities associated with all men's and women's responses to selected development issues

Comparing the means of men's and women's responses			
Compared Responses	Family	Community	Children's Lives
Nature & environment	0.195	**0.029**	**0.015**
Business development	0.94	0.13	0.393
Tourism	0.086	0.336	0.704
Figures shown represent the probabilities of equal means			
Bold indicated significance at the 5% level or less			

It is interesting to note that these data suggest differences in attitudes, between men and women, in terms of the importance of issues of nature and the environment, both for the community now and for future generations.

8.5.3 Perceptions on environmental change in the forest

In order to investigate the perception of the Paser indigenous people to environmental changes that have occurred in the area, some simple questions about these changes were put to the men. A summary of these responses is shown in table 8.6 and indicates that changes in the forest ecosystem in which they live is currently a major issue.

When asked about the things that have changed in the case of environmental functions, four main issues were raised (as shown in table 8.6 below): the smaller number of animals, less birds, or more insects and more winds. Based on these interviews, the data is made up of ordinal variables, which indicate what type of change has occurred, and a non-parametric chi square test could be used to analyse the significance of any differences between the villages. Similarly, cross-tabulation of the data to control for age would be interesting, but for brevity, such analysis is not included here. The responses in each village are shown in table 8.6 and it is important to note that data shown here (as percentages) refer to people's perceptions of change, rather than actual changes.

It seems clear that there are differences between these villages in terms of how people perceive their environment. It is interesting to note, for example, that in the village of Pinang Jatus (near a large oil palm plantation and a market), a higher proportion of people (65.5 per cent) feel that there are *less* (fewer) animals in the forest than before. In the case of Rantau Layung, there has also been much forest disturbance in the area, due to exploitation by logging concessions in the past thirty years. People also think that there are less animals, less birds, and more insects as a result of environmental change. In the case of Muluy, this village is much more cut off from other influences and, as a result, fewer people feel that the impact on forest animals is noticeable.

Table 8. 8. Men's perspectives on environmental changes in three Paser villages (%)

Observation from the last 10 years	Muluy	P.Jatus	R.Layung
Think there are **less** animals in the forest now than before	42.1	65.5	58.7
Think there are **less** birds in the forest now than before	37.8	62.4	51.6
Think there are **more** insects around now than before	57.9	96,6	95.4
Think there is **more** wind than before	56.4	62.4	44.8

Note: For linguistic simplicity, the terms **more** and **less** were used in the interviews, instead of the grammatically correct **fewer**.

In the case of birds, the situation is less clear. It does appear that in Pinang Jatus and Rantau Layung villagers do think that there are *less* (fewer) birds around than before. These findings are influenced by the fact that bird trappings were not a priority activity for these people. As a result, some respondents did feel that there were less birds around than before. The presence or absence of birds in the forest is crucial to the well-being of the ecosystem as a whole (Tropenbos 2006), as they are responsible for seed dispersal over wide areas.

A very clear difference exists between the villages in terms of their response to the question about insects. In both Pinang Jatus and Rantau Layung, where market-orientated farming is more prevalent, high proportions of respondents stated that insect populations had risen considerably. By contrast, in Muluy, where fewer developments have taken place, a smaller number of respondents indicated a change in the level of insect infestation. The use of pesticides by farmers is virtually non-existent (only 3 per cent of all farmers interviewed reported using chemical fertiliser), as few have enough cash to buy it. Previously, such chemicals were subsidised by the government, NGOs and companies/agencies. Today, however, this is no longer the case and infestation by a number of insect pests is widespread. At some stage there was intensive use of Baygon, a chemical insecticide product to kill mosquitos and other insects. There is no evidence that local indigenous forest plants contain pesticides.

In relation to observations about *wind in the air*, a higher proportion of people in Muluy reported an increase in wind compared to the other villages. Although this is clearly a very subjective observation, some literature (Clusener-Godt & Sachs 1995) suggests that deforestation can give rise to more windy conditions. Given the fact that a large part of Muluy was deforested some time ago, and due to its position on the top of a range of hills, it is different to the other two villages and, therefore, it is not surprising that more people in that village have made such an observation.

8.5.4 Perceptions on forest function

To investigate how forest functions are perceived by the indigenous people, respondents were asked to consider a number of forest functions, and to assign a value to indicate the importance of each of these. Based on our interviews we found that twelve forest functions were raised by households. When they were asked to give them a score from 1 to 5, in order to indicate the importance of each function, it was revealed that the response varies from men to women, as shown in table 8.7 below.

This examination of forest functions elicited truncated interval data, which can be used for a number of different statistical tests. In this situation, however, analysis of variance is used to test the null hypothesis of no difference between the means of the diverse groups from the villages. This is done by estimating the variance between and within the groups, and testing the significance of this using an *F* test, which measures the ratio of the mean squares within and between groups.

When the computed value of *F* is greater than the corresponding critical value of *F*, then the null hypothesis, of no difference between the means, can be rejected. Thus, any significant result would imply that the difference that exists between the tested groups is one that is unlikely to be the result of chance (5 per cent chance or less). This process is illustrated here by people's responses when questioned about forest functions, which appear to illustrate that there are some gender difference in the villages. To examine this further, a null hypothesis of no difference between the means of men's and women's responses is tested.

Tables 8.9, 8.10 and 8.11 show the mean and standard deviation of scores given by men and women for each forest function in each of the villages.

Table 8.9; 8.10 and 8.11 Differences in forest function between villages:

1. Foods and fruits	2. Shade
3. Source of fuel wood	4. Source of cash income
5. Influences rain and weather	6. Source of medicine
7. Source of building materials	8. Hunting place
9. Burial ground	10. Affecting water flows
11. Spiritual place	12.Culturally important

Table 8. 9. Responses from Rantau Layung

Forest function	1	2	3	4	5	6	7	8	9	10	11	12
Men's mean score	**4.6**	3.2	**5**	**4.85**	2.7	3.95	4.25	**4.8**	1.85	3.25	2.5	**4.15**
S.D of men's scores	0.7	1.7	0	0.67	1.59	1.19	0.97	0.9	1.46	1.45	1.82	1.5
Women's mean score	3.6	3.7	**4.29**	**4.67**	2.29	3.9	3.48	**4.1**	1.9	2.19	2	2.19
S.D.women's scores	1.7	1.3	1.19	0.73	1.68	0.89	1.5	1.5	1.41	1.29	1.64	1.57

Table 8. 10. Responses from Muluy

Forest function	1	2	3	4	5	6	7	8	9	10	11	12
Men's mean scores	**5**	3.67	**5**	**5**	3.43	3.46	3.64	**5**	1.93	2.87	1.74	**3.8**
S.D of men's scores	0	1.49	0	0	1.65	1.65	1.35	0	1.63	1.62	1.77	1.85
Women's mean scores	**5**	3.9	**5**	**4.87**	3.43	3.43	**4.17**	4.9	2.57	3.52	2.5	3.2
S.D women scores	0	1.45	0	0.73	1.83	1.83	4	0.4	2.03	2.5	1.06	1.99

Table 8. 11. Responses From Pinang Jatus

Forest function :	1	2	3	4	5	6	7	8	9	10	11	12
Men's mean scores	**4.52**	3.32	**4.72**	**4.54**	3.1	3.25	3.45	**4.55**	1.77	2.81	1.9	**3.48**
D.of men's scores	1.24	1.72	0.97	1.16	1.69	1.54	1.63	1.19	1.63	1.61	1.81	1.91
Women's mean scores	**4.54**	3.28	**4.65**	**4.23**	2.8	3.17	1.7	**4.38**	1.7	2.38	2.23	2.33
D. women's scores	1.24	1.68	1.01	6.21	1.74	1.59	1.5	1.31	1.5	1.65	1.93	1.80

Note: Respondents were asked to assign a score from 1 to 5 to each of the forest functions, according to how important each was. (100% of household represented). Since bead counters were used to assign scores, the numbers obtained are implicitly on an interval scale, thus amenable to parametric testing.

From these tables it seems that, for both men and women, a high value is placed on each obvious forest function as provision of food and fruits, fuel wood, building materials and cash income. While men in a particular place attribute a higher value to the forest as a hunting place, women place a higher value on its role as a source of medicine and also as a source of cash income. In relation to the more obscure forest functions, such as influencing weather and rainfall, no gender differences seem to exist. In the case of affecting water flows, some women have given this a higher value, while men give a higher value to the rest being culturally important. Again, by applying an analysis of variances to this data, it is possible to identify more clearly where the variance, if any, exists. This is examined further in the following sections.

8.5.5 Gender differences in the assessment of forest function

Intuition suggests that there may be gender differences in perception of forest functions. A summary of the average scores assigned to these forest functions by men and women are shown in tables 8.8a, and b, and an analysis of variances is applied in order to investigate these differences further. This table shows that the computed value of *F* is greater than the critical value, and thus all hypotheses (of no differences between the variances of the groups) are rejected. This suggests that for both men and women, significant differences do exist in how forest functions are 'valued' (represented by the columns). The detail of these results are shown Appendix 4, but to summarise, in Pinang Jatus, a variances of over 2.00 occurs for 63 per cent of men and 47.6 per cent of women, while in Muluy this occurs with 70 per cent of men and only 6.6 per cent of women. In Rantau Layung**,** the responses of 72 per cent of men demonstrate a variance of over 2.00, yet for women this figure is only 35 per cent. This preliminary investigation suggests that the people's perceptions of forest function are not homogenous across the villages, and the differences between and within the villages are significant.

Table 8. 12. Summary of the results of an analysis of variance of responses to question on forest function.

ANNOVA results of responses on forest functions all men and women						
Source of Variations	Sum of Squares	Degrees of Freedom	Men Square	F value	P-value	Critical Value of
MEN						
Rows	591.24	118.00	5.01	**2.76**	0.00	1.24
Columns	1412.08	11.00	128.37	**70.67**	0.00	1.80
Error	2357.75	1298.00	1.82			
Total	4361.07	1427.00				
WOMEN						
Rows	896.72	119.00	7.54	**2.00**	0.00	1.24
Columns	1410.56	11.00	128.23	**34.07**	0.00	1.80
Error	4927.03	1309.00	3.76			
Total	7234.30	1439.00				

After identifying those forest functions that give rise to most variation in responses, a paired two-sample t-test is applied to test for any significant differences between the means. This method is used since there is a natural pairing of the data, due to the fact that the responses are from men and women in the same household. In this approach, the variances of the populations are not assumed to be equal, and thus the sample cannot wholly be regarded as independent. It has been shown (Edwards 1967), that the t-test is robust, in the sense that it can still produce reliable results when the conditions of normality of distributions and homogeneity of variance are not fully met. Thus it is appropriate to apply it to situations such as the one illustrated here. The results of these tests are found in table.8.8b and this table shows the probabilities of any differences in the means of men's and women's responses. These figures are generated through the analysis of 119 pairs of men and women from all three villages.

Table 8. 13. Gender differences in perception of forest functions

Testing the difference between men 's and women 's scores on forest functions							
Money income	Source of building materials	Influences rain and weather	Source of food	Hunting	Medicines	Influences Water flows	Cultural importance
0.575	**0.450**	**0.309**	**0.626**	**0.364**	**0.526**	**0.228**	**0.212**

Note: Figures show probabilities of equal means occurring by chance.

This shows that there is only a significant difference between the means of men's and women's scores on the questions of cultural importance, on which men consistently place a higher 'value' than women do. This means that for this function, the null hypothesis is rejected, and thus a gender difference can be said to exist in how people perceive the cultural importance of the forest. In the case of all the other functions tested, there are no significant differences between men's and women's responses. This suggests that a degree of homogeneity exists in the way Paser people in general may perceive forest functions. It is possible to analyse differences in perceptions between villages, by applying further t-tests.

The results of these are shown in table 8.8.c. From this it can be seen that significant differences do exist at the 5 per cent level or less, in how people assess forest functions. For both men and women, the most significant differences exist between Rantau Layung and Muluy regarding the importance of forest as a source of building materials, a source of income and a source of hunting, fuel wood, food and fruits. By referring back to table

8.7, it can be seen that for men in Muluy, a higher score is assigned to each of these than is the case for Rantau Layung. For women, the differences are not so clear-cut.

Table 8. 14. Perception of forest function across villages, for both men and women

Differences between villages on men' s and women's scores on forest function									
	Money income	Source of building materials	Influences rain and weather	Source of medicine	Source of food	Burial ground	Influences water flows	Spiritual place	Place of cultural importance
MEN									
P.Jts/Mul	0.361	0.330	0.156	0.341	0.044	0.852	0.350	0.168	0.427
P.Jts/R.L	0.786	0.131	0.335	0.036	0.008	0.831	0.253	0.202	0.106
Mul/R.L	0.477	0.000	0.000	0.229	0.481	0.000	0.000	0.195	0.262
WOMEN									
PJts/Mul	0.529	0.316	0.044	0.385	0.146	0.214	0.004	0.401	0.068
PJts/R.L	0.299	0.450	0.309	0.012	0.641	0.494	0.719	0.682	0.842
Mul/R.L	0.065	0.632	0.133	0.001	0.010	0.040	0.003	0.548	0.046

A significant difference also exists between men's responses in Pinang Jatus, and those from both Rantau Layung and Muluy in relation to the importance of the forest as a source of food. Again, a closer look at table 8.8.b indicates that the score in Pinang Jatus is higher than in the other villages, confirming the important role of forest plants for food security for poorer households. It is interesting to note, however, that women in Muluy give a significantly higher score for forest food than do women in other villages.

In relation to medicinal plants, some significant differences between the villages is found. For men, the means of the responses from Rantau Layung are higher than those in Pinang Jatus. For women, responses from both Rantau Layung and Muluy are significantly different from Pinang Jatus, but not from each other. In both Muluy and Rantau Layung, the supply of medicinal plants is considered more important as a forest function than it is in Pinang Jatus. This could be explained by the fact that both Muluy and Rantau Layung are more traditional villages compared to Pinang Jatus, which is a village located close to the market and an industrial oil palm development scheme. Moreover, the area is inhabited by a large number of migrants from a number of different places.

Overall, these observations suggest that gender and other differences do exist in perceptions of forest functions. One implication of this is that, given the dominant role of women in child-rearing, this gender difference in 'value' may have some important implications for people's perceptions of forests and for environmental valuation in this area. All of these differences between the various groups studied here could be examined in much greater detail using a number of alternative statistical tests, but this is beyond the scope of this work. Nevertheless, it has been shown here that variations in social values do exist, and these are likely to influence people's behaviour and attitudes.

Figure 8. 4. Forest as source of income; selling timber is the men's activity.

8.6. Paser Cosmovision

The origin of humankind, of the spirits, of animals, of sickness and death, of war and social order, and of the nature is explained in the vast mythological complex of *Belian* and *Kwangkai*. These myths belong to the special knowledge of traditional healers, including the secondary mortuary rites. The common knowledge of *Belian* or *Kwangkai* is only fragmentary, and refers to the narrative core of the myths, omitting the often very detailed genealogies of spirits and cultural heroes (Hopes 1997).

The availability of Paser *Belian* and *Kwangkai* documentation is very scant compared with that available for the Dayak Benuaq or Lundayeh. Some compilation of Paser myths is found in the manuscript of Assegaf (unpublished 1995). According to this book, Paser people have many stories of heroism and mysticism, such as a man who is able to kill his enemy from a 15 km distance just by using a blowpipe made of ironwood or *ulin* (*Eusideroxylon zwageri*); the so-called *sumpit*, a women with long and big breasts who can defeat *gerombolan* [9] while feeding her baby; and a man who can reach the top of a wild honey tree without climbing. There are also myths about transmitting a disease to someone who has made a mistake and he would never been cured of this disease if he does not come back to apologise. There were many stories or myths told by respondents during the field research but most of these stories dealt with ghosts or were about trying to generate fear among the listeners.

The general perception of the people in East Kalimantan, that the Paser people are *Pengguna-guna (Ind.)* or mysterious people, has existed since long ago. In the documentary reports made during Dutch colonial times, Ian Black mentions that the Paser have a strong and different attitude towards the presence of the Dutch military in Tanah Grogot (current capital district) in 1912 than they do about their presence in the Martapura King Region in South Kalimantan. The war against the Dutch military in Pasir was led by the King of Pasir Sandurangas. They repelled the Dutch military troops, forcing them to return back to their base in South Kalimantan. Later, these troops, with the help of soldiers belonging to the Sultan Martapura, came back to conquer the Pasir (Black 1990). Constructing a negative image about the Paser being a backward or *pengguna-guna* group of people was used as a method to defeat their cohesiveness. In fact, this method was employed not only by the colonial authorities, but also by the Suharto regime in order to promote the transmigration programme and industrial oil palm development in Pasir.

According to Lawut (*adat* chief of Pinang Jatus) the villagers in his village originate from two regions. The first group came from Mount Lumut or a forest area, and the second group came from the North Barito River or Central Kalimantan. He called the first group 'the men of the forest' (*orang hutan*) and they were seen as 'second class' human beings who do not have a right to be appointed as *kepala adat* but who can be elected as *kepala desa* (village chief). The main reason for this perception is that people from the forest do not fit into *adat* roles and, therefore, they cannot be elected as *adat* chief. Attempts to discuss this issue with respondents confirmed that this group is viewed as 'forest people' or *orang hutan.* It also became clear that the appointment of a *orang hutan* member as *kepala adat* was said to be the cause of some diseases that occured in the village of Pinang Jatus a long time ago.

The impact of this stratification is also found in land and forest products properties. An example is the property of wild honey trees in the forest, which are almost all managed by the family of the *adat* chief. The *adat* chief also manages the land close to the honey trees and claims them as his family property. Another example is the small-scale timber in the village forest area of Pinang Jatus. This business is operated by relatives of the *adat* chief and he controls all the benefits from this site, distributing them only among his family or relatives. This situation differs slightly with that in Rantau Layung, where

9 *Gerombolan* is the term for certain group of people who come to collect the village property by force and by burning the village. According to Semok (adat chief of Rantau Layung) it happened during the Second World War or before the region was handed over from the Dutch to the Japanese authorities in 1942.

almost every household has its own honey trees. In this villages, the forests are seen as belonging to everyone, and no small timber cutting business is found here.

Figure 8. 5. This statue made of ironwood symbolises the existence of ancestor worship

in Rantau Layung.

It has been described in Chapter 5 that indigenous Paser people in Rantau Layung divide their lands for various important products or purposes. These consist of *Tana Alas, Awa Pangeramu, Awa Umo, Tana Ekang*, and *Alas Nareng* (see traditional land arrangements, in Chapter 5). The division was made on the basis of their perceptions on nature and a strategy to elaborate the needs for survival with the conditions of nature and the resources they have. These lands are maintained not only for the harvesting of products for daily needs, but also for the conservation of some ritual plants that are needed for special events (see also Appendix 6 for a list of plants for rituals). The rites for pregnancy and after birth, weddings and agricultural cycles are often complementary with the existence of certain plant leaves and forest products, including animals.

During the study period, most families engaged in at least one of the five rites conducted by Paser people. The biggest ritual, the curing of one old man's disease or *belian*, took place in 2006 in Pinang Jatus and involved all households. The people shared in the costs of the event and they provided all kinds of materials.

Rituals are part of the local culture and religion. The influence of Islam is found in birth and marriage rituals. On the whole, however, in areas where there is a very strong influence of Islam it is hard to find *belian* or *kwangkai* rituals anymore. Considering the current life or death rituals that still exist among the Paser people, it can be concluded that they still contain elements of three spheres of influence – Islam, Christianity and

Kaharingan. Some of the older people in the village of Rantau Layung and Pinang Jatus were Christian and *Kaharingan* followers before they converted to Islam in the late 1970s. *Kaharingan* is recognised as a variant of Hindu Dharma and has been officially acknowledged as a religion of the Dayak in Kalimantan Borneo since 1986 (Gonner 2003).

The cosmovision of tribal groups has been discussed by many ethno-botanists and anthropologists (Weinstock 1983; Slikkerveer 1999; Gonner 2002; Schefold 2002). It is not the objective of my study to go deeper into this subject and, therefore, any exploration and analysis of this is only with the aim of providing preliminary information for further research.

8.7 Conclusions

The outcome of the social and cultural analysis of people's perceptions confirms the existence of indigenous environmental knowledge regarding the forest services and their role in the indigenous local culture. The analysis also confirms that the perception of future development and environmental damage has increased the concerns of the villagers with respect to the future use of resources and their sustainability. This condition is a result of the lack of government recognition of their rights to natural resources, in particular for the collection of wild honey in logging concession areas and for the rattan produced from small-scale cultivated gardens.

The analysis of the different perceptions of forest functions between and within the villages among men and women and other groups has been presented in this chapter. All of these differences between the various groups studied here could be examined in much greater detail using a number of alternative statistical tests, but this is beyond the scope of this work. Nevertheless, it has been shown here that variations in social values do exist, and these are likely to influence people's behaviour and attitudes to their environment and forest conditions.

In addition, this section has been an attempt to broaden the economic concept of value by revealing qualitative data about forest resources. Given the current emphasis on participatory forest management and stakeholder involvement, any assessment of forest value should not ignore this type of information, as it has important policy implications.

By investigating this perception and the social and cultural dimensions of forest values, it is clear that the forest itself is fundamental to the way of life of the Paser indigenous people. This is important to remember when considering alternative uses of forest resources. The impacts that these may have on local people and the implications of this for policymakers are discussed in Chapter 9.

Chapter 9

Synthesis and recommendations

9.1 Introduction

The purpose of the economic valuation of forest resources is not necessarily to put a total value on nature, but rather to make the value of forest use explicit (Michael 1995). As one can see in the literature, there has been a great deal of interest in estimating the total economic value (TEV) of forests (Gregory 1987; Kumari 1995; Adger et al. 1995). The TEV is an aggregate of (1) total use value, plus (2) total non-use value. The total use value can be divided into the direct use value, indirect use value and optional use value. Total non-use value includes existence value and bequest value (see also Chapter 2). Different values are estimated in a particular situation by applying specific techniques. The TEV is expected to be the sum of the various values (Bann 1995).

The main objective of this research was to study and analyse the importance of non-timber forest products (NTFPs) as a component of the resource base of tropical forest. Following a discussion of currently used valuation techniques in Chapter 2, an attempt has been made to quantify the use-value of these products in monetary terms. Although clearly the value of an ecosystem goes far beyond its direct use value (Constanza et al. 1998), an identification of such use-values can form the basis of an estimate of the Total Economic Value of that resource (Pearce 1998).

The ecological importance of non-timber forest products is still not fully understood (Peters 1994), but some aspects of this have been discussed in Chapter 2, along with an account of strategies for forest management in Chapter 4. An outline of the state of forest resources and their role in the Paser context is provided in Chapter 5, and on the basis of the methodology used here, as outlined in Chapters 6, 7 and 8, a monetary value for NTFPs used by Paser indigenous people has been estimated.

9.2 Forest value beyond timber

The previous analysis in Chapter 6 and 7 has shown that the total monetary value of forest input used in the three study villages amounts to Rp. 1,159,795,000 (US$124,633) per year. At the same time, during the fieldwork conducted for this study (2004-2006), 123 households were interviewed in three villages, representing 577 persons. On this basis, the value of forest use was calculated to be Rp. 9,429,227 per household, per annum (or US$ 1,013.89). This value represents the monetary return on forest land generated as a result of the investment of labour and capital. In terms of the Total Economic Value, as discussed in Chapter 2, this represents the net rent, shown as area B in Figure 2.1 (page 17).

Given the homogeneity of Paser households (see Chapters 4 and 7) and the fact that the Paser population of the Gunung Lumut area is 12,612 people (BPS 2006). [10] This would imply that, on the basis of this study, a monetary value of non-timber forest product use from that area would come to a total of Rp. 25,089,757,570 (US$ 2,697,823). Since the Gunung Lumut Protection Forest area and the range of this human territory is actually covered with forest for 82,000 ha (Paser Forest Department 2007), it can be estimated that the use value[11] of non-timber forest products by Paser forest dwellers in this region amounts to Rp. 305,972 or US$ 32.90 per hectare, per annum. Although this value does not seem to be large, it conforms with the limits of other studies, as shown in table 9.1 below. Other studies that have investigated the value of NTFPs have tended to look at specific forest products, such as rattan (Kumari 1995; Peluso 1996; Belcher 2004), forest foods (Padoch 1988), and fuel wood (Leach 1993). A comprehensive study of a wider range of simultaneous NTFP use has rarely been attempted before. Some of the economic data obtained from other studies are shown in table 9.1.

Table 9. 1. Economic values of NTFPs obtained from previous studies.

Source	Location	Product/service measured	Monetary value (US$/year)
Kramer etal. (1995)	Madagascar	Extracted forest and farm products	$91/household $3.2/hectare
Ruitenbeek (1989)	Cameroon	Medicinal plants	$0.2 to 0.7/hectare
Mendelsohn & Balik (1995)	All tropical forest	Value of undiscovered drugs from tropical plants (option value)	$0.9-1.3 / hectare

10 The estimated population of Gunung Lumut Forest Area is 12,612 (BPS 2006). This study represents a total of 523 Paser from that area, which is 4.15 per cent of the regional total. It is assumed that the sample is an adequate indicator for providing an insight into the general household trends in the region.

11 It must be noted that part of this use-value accrues as a result of the application of social capital in the form of indigenous knowledge embedded in the Paser indigenous culture.

Peters, Gentry & Mendelsohn, (1989)	Peru	Potential value of extracted materials	$400/hectare
Schwartzman (1992)	Brazil	Brazil nuts and rubber	$4.8 / hectare
Schwartzman (1989)	Brazil	Extracted values, rubber and wild game	$2,458/ household
Gunatilleke et al. 1993)	Srilangka	Non-timber products	$12.76/hectare
Pearce (1998)	All tropical forest	Carbon storage	$600-4,400/ hectare[12]
Melnyk (1995)	Venezuela	Wild foods	$0.46-9.87/hectare
Sullivan (1999)	Guyana	Non-timber products	$2.25/hectare
Bann (2007)	All tropical forest	Non-timber products	$0-100/hectare
Kumari (1995)	Malaysia (Selangor)	Rattan, bamboo and animal base NTFPs	$42/hectare
This study	**Paser, Indonesia**	**Non-timber products**	**$32.90/hectare**

Notes : US$ 1 is equal to Rp. 9,300

The values shown in this study represent an imputed accounting value, which can be of use to policymakers and could also have important implications for people who live in such villages. Estimates such as these could be used as one of the indicators of the amount of compensation that would need to be paid in perpetuity [13] in the event of such villages losing their access to the forest as a household input. This situation may arise, for example, in a location due to be taken over for the purpose of developing an oil palm plantation, transmigration development, protection forest, logging concession and timber estate development, or any other activity that may result in the loss of access to products and services of a forest resource. When combined with conventional timber values, which may range from US$130-150/m3 in Indonesian forest (MPI 2006; ITTO 2007)[14] , the figure could also be used as a guide for the purpose of evaluating the cost of a forest fire, flooding or other ecological disruptions.

12 This is based on an estimate of carbon released as a result of deforestation, based on a carbon release rate of 100-200 tons/ha (depending on the type of forest and subsequent land use), and a value of carbon damage in the atmosphere of US$20 per ton (Frankhausen & Pearce 1994).

13 Assuming an infinite income stream accruing from sustainable subsistence livelihood, the sustainability of livelihood in the study villages is not yet proven. However, given the fact that many households follow the traditional way of life that has evolved and endured over centuries, some degree of sustainability at least can be assumed (Messerschmidt & Hammet 1998; Bappeda Pasir & Puslit Pranata Social UI 2002).

14 The estimated gross-standing timber volume of Pasir Forest is 180 m3/ha, less than 5 per cent of this is recoverable in a single felling due to a high volume of non-commercial species and felling damage (Sutisna 2003).

9.3 The income accounting framework approach to valuation

Difficulties associated with the income accounting methodology are relatively well known but, in spite of these, economic analysis in virtually every country in the world depend upon it. In spite of its wide application in the macro-economic sphere, the methodology has not previously been applied to the valuation of environmental resources and it is hoped that this study demonstrates that such a procedure can be used to good effect in certain circumstances. It is clearly a relatively data-intensive method, which can only be used when relevant data are available. This research also shows that it can be used to assess the value of nature as an input to production. The need to incorporate nature into production functions has been highlighted by Binswanger (1998), and this study shows that it is possible, in some situations, to do this relatively easily. Given the serious philosophical and methodological difficulties associated with conventional environmental valuation techniques, the identification of monetary values for environmental resources using this approach may well take the valuation debate a step forward.

9.4 Incorporating a non-monetary dimension to environmental values

An important prerequisite to achieving sustainability is the need to incorporate monetised environmental values in decision-making; however, there are many aspects of environmental attributes that cannot be assigned a monetary value. As a result, it is important to widen the utilitarian concept of value favoured by neo-classical economics, to incorporate a broader spectrum of what is meant by the term 'value'. From a philosophical and ethical perspective, values may have an anthropocentric or biocentric focus, while the ecological approach stresses the fact that environmental values should incorporate some acknowledgement of the vital life-support functions provided by ecosystems. In contrast to this, the sociological approach argues that values are based on cultural norms and standards, the institutional approach stresses that values are influenced by property rights, and in psychology, values represent embedded concepts generated by our upbringing and genetic background.

From a practical perspective, although it may be difficult to bring all these interpretations together, it is useful to bear in mind that any monetary value applied to the environment should represent the value placed on it by society as a whole (see also Chapter 8), in the event of the resources being used up. As a result, it is important that any attempt to place a value on a resource should incorporate the views of all those involved, and in addition, some non-monetary dimensions reflecting the broader interpretation of value, should be included. In this study, an attempt is made to do this by incorporating some assessment of the social and cultural values attributed to forest resources by the Paser people in the Gunung Lumut Protection Forest Area. This was outlined in Chapter 8, and it has been shown that for these forest dwelling people, non-timber forest products play an essential role in their lives, and failure to incorporate this into the decision-making process is not only likely to lead to an economic miss-allocation of resources, but may also bring about a cultural weakening that is not in line with the spirit of sustainability, as defined by Agenda 21 (UNCED 1992).

9.5 Drawbacks and omissions

As with any study, the quality of data used is crucial to the reliability and validity of the results. During the fieldwork conducted for this research, I took every care to capture an accurate coverage of the economic life of Paser villagers, and on the basis of the collected information, aggregation facilitated the generation of annual values. Difficulties always arise with aggregation procedures, but from a practical perspective these are relatively minimal compared to the huge cost savings resulting from the use of the methodology outlined in this thesis. The values generated in this study provide an informed estimate of direct use-values, and while they provide a useful starting point, they can certainly be improved through the incorporation of additional data collected during different seasons or over longer time periods.

Without more comprehensive details about hunting and fishing catches, estimates of revenues generated from them cannot be regarded as definitive. As a result, the values of these items must be seen in this context. Although the wildlife values arrived at in this study represent a sizeable portion of the total NTFP value, the amount is only Rp. 21,275,000 or 5.3 per cent of the total forest output values in all villages. These are, nevertheless, underestimates of their full monetary value since no attempt is made here to include the value of the ecological functions provided by the numerous species involved.

In the case of any estimates based on market prices, several problems arise. One of the most obvious is the fact that the obtained values will reflect the purchasing power of the currency of the country concerned. In the case of countries such as Indonesia, a number of factors have contributed to low currency values and, as a result, values obtained from market prices there will be much lower than those obtained in studies elsewhere, when the currency (and the economy) are stronger. Not only does this make international comparisons of values more difficult, but it also means that even when purchasing power parity convention factors are used for currency conversions, values calculated from the study in one country cannot easily be applied to another. In addition, from a theoretical perspective, values based on market prices do not represent Total Economic Value since they do not include the value of 'consumer surpluses'.

In this study, an example of a weakness in this valuation methodology was demonstrated in the calculation of medicinal plants. By using the price of *Pasak bumi* (*Eurycoma longifolia*) as a representation of the value of all types of medicinal plants, some estimate is made of the possible value of these plants to the Paser households. It is clear that such plants could have important applications within the global economy. In real terms, both their current and optional values are likely to be much higher. Much more detailed information on the extent and frequency of the use of such plants is needed to facilitate more accurate estimates of this value, but at least the figures here offer some baseline for comparison. An alternative approach to the valuation of such values could be made on the basis of plants used for malaria treatment, using the cost of conventional malaria medicines as a proxy for their value. This has not been attempted here as it has not been possible to obtain accurate figures from the Paser health authorities. It has to be remembered, therefore, that the estimate included in my thesis cannot be considered to be an accurate representation of the full use-value of medicinal plants, and these figures certainly do not represent the possibly huge option values that individual plants may have.

Since the focus of this work has been to estimate the use values of NTFPs, no carbon values have been included, and no attempt has been made to assess the value of water consumption and flowers, such as wild orchids, since they are not used by Paser people in this area. These both represent important aspects of non-timber values, and in the case of wild flowers, their importance includes their value as amenities, as well as the very important ritual role that they play in cultural ceremonies. Their exclusion inevitably means that the final values calculated here are likely to underestimate the full use-value of non-timber forest products.

Negative residuals, which have arisen for certain activities in some households (as shown in the analysis in Chapter 7), can be explained in a number of ways:

- In some households, it may be the case that crops have been damaged by pest attacks, which can destroy whole crops, thus resulting in lower outputs in relation to labour inputs.
- Some households may have overestimated the hours spent on various activities.
- Some households may have overestimated (for a variety of reasons) their output levels.
- In some households, although a man is said to be a resident, he is actually living elsewhere, and therefore does not have a real input into the labour supply. This may be particularly relevant where a man has left his family, but that fact is not publicly acknowledged.
- Data errors may occur in collecting information from certain households, and some households may be made up of an extended family, yet details may have been reported by individuals relating to their immediate family

Although some errors in calculation may always be present in exercises such as these, some of the weaknesses described above could be overcome if the study had been conducted over a whole year period, taking detailed measures of all activities from all households. While this would not be impossible, it would be extremely costly, and given the fact that the figures generated in this study are not out of line with similar studies, this does not seem to be necessary. From the point of view of development policy applications, obtaining information relatively rapidly is very important and thus more in-depth approaches, which are more time-consuming, may be impractical.

9.6. Cultural and social capital

One of the objectives of this study has been to highlight the social and cultural dimensions of resource endowments in Paser communities, and to incorporate them into our concept of value as it applies to tropical forest resources. It is recognised that the process of sustainable development requires more than economics and technological change. The achievement of sustainable rural livelihoods, for Paser people in particular, depends on the effective utilisation of all resource endowments within their forest area, in addition to their financial and physical capital, which also includes the social and cultural capital they have.

The importance of the social and cultural dimension of forest use has been highlighted in Chapter 8, and by including traditional non-monetary values into the system of environmental valuation, it is more likely that alternative lifestyles will be secured and this broader meaning of sustainability will be achieved. The cultural dimensions, the way of using NTFPs and their response to forest change and the future use of NTFPs is an example of traditional knowledge, and highlighting its value has been discussed. I hope that this result will make some contribution to the achievement of forest use sustainability in the research area.

There is no doubt that technological change in agricultural development has an important role to play in sustaining both food supplies, and the environment as a whole (Aldye et al. 1998). The need to integrate technological and scientific knowledge with more traditional and cultural forms of knowledge is one way in which this goal may be achieved.

The need for this change of focus has arisen out of an increasing awareness of the role played by nature, and the realisation that our ecosystem is finite. The need to incorporate nature as a component of the production function has been clearly demonstrated, but it has also been pointed out that it will be necessary to undertake a re-orientation of the economic theory that is used as a guideline for today's practical and political dimensions (Biswanger 1993). Such a reorientation of economic theory, questioning as it does the methodology of conventional neo-classical economics, represents a paradigm shift, which by definition implies a reorientation of the world view around which reality is organised (Tacconi 1998). As a result, the alternative 'ecological economics' paradigm has evolved, representing 'an issue-driven discipline, concerned with the analysis and the achievement of sustainability' (Constanza et al. 1991).

9.7. NTFPs prioritisation

Renewable resources need to be managed in such a way as to enable them to be renewed through the maintenance of biodiversity, hydrological cycles, soil fertility and essential vegetative cover. These principles are crucial if sustainability is to be achieved and, in relation to tropical forests, they are often overlooked in the drive to generate income from forested areas. When governments are faced with increasing demands from growing populations, adverse global economic conditions and political pressure, it is often difficult for them to devise ways of meeting the needs of both current and future generations.

One of the reasons why deforestation continues to occur so rapidly in many forested countries is the fact that income from timber extraction is often seen as the only economically viable land use option. The decision is made on the basis of the net present value of projected income flows resulting from the sale of timber. One of the problems with this decision-making process is the fact that the discounting process involved in the calculation of the net present value, often implies a preference for the present over the future, with benefits appearing in the future seeming to be totally unimportant. It does seem clear that if the value of NTFPs can be incorporated into the appraisal process, it may well be that the decision to allow a logging concession will seem less optimal. The opportunity cost of the logging operation will be higher due to the loss of NTFP income flows. In addition, logging revenues tend to be limited over time, whereas income flows from the sustainable harvest of NTFPs have the potential to generate infinite income streams.

Failure to account for both monetary and non-monetary NTFP values in the decision-making process implies that decisions to remove forest resources often have devastating effects on the well-being of forest dwellers. This happens when the materials, food and medicines to which they normally have access, are no longer available, but this loss is not compensated for in any way since its value is unmeasured. This is clearly sub-optimal in Pareto terms, and it is certainly not sustainable, since the way of life for those dependent on these resources is undermined, possibly forever.

One particular aspect of NTFP use is as an emergency food supply. Fortunately for the majority of those living in the study villages, this emergency use of forest foods is not a frequent occurrence. Nevertheless, over 90 per cent of these households collect such food on a regular basis. During my fieldwork period in 2006, the common food collected from the forest included sagu, bamboo (*embut*), and wild *cempedak*. Although there is clearly a significant seasonal variation in the availability of these forest foods, it is generally recognised by local inhabitants that in seasons when foods are not available, other food products come into season and the prices of these are fairly consistent throughout the year. As shown in Chapter 5, the variety of foods gathered from the forest also makes an important contribution to the quality of the diet of forest dwellers, providing a range of essential vitamins and minerals.

By highlighting the importance of these forest products, and incorporating their use into forest management strategies, it may become possible to not only increase food security in such communities, but also to promote possible income generating activities based on NTFP and services. These could include better marketing strategies for existing products, as demonstrated by the harvesting and export of rattan from Sanggau or wild honey in the Lake of Sentarum in West Kalimantan (SFDP 2004). Other income generating activities could arise through wise use of forest ecosystem services, by the development of markets, such as the one found in the nearby area of Penajam Pasir Utara District, for rattan, forest fruits, wild honey, orchid farming, or the domestication of wild animal species like the *sambar* deer (*Cervus unicolor*) for the production of bush-meat.

9.8. Providing financial capital as a development tool

As in most subsistence economies, these villages exhibit high labour capital ratio indicating that production is a very labour intensive activity (as can be seen inChapters 6 and 7). This is confirmed by data from the qualitative survey, which reveal that one of the main market failures in the villages is that of the capital market. Capital market failure is a major factor contributing to the poverty in villages of this type, and it is a serious problem that is unlikely to be solved if left in the hands of the free market, since transport and secure costs in such remote areas are very high. Although it cannot be certain that an increase in financial development is a prerequisite to national economic development, it is certain that the lack of regional financial development is a significant hindrance to the development of rural communities in Paser.

The policy implication of this for the government is that action should be taken to promote the development of rural banking and credit markets, to facilitate an increase in the use of capital and technology in these villages. This could be achieved by the development of 'village banking', or a 'village cooperative', where the government or a funding agency lends a sum of money to the village as a whole. This money is then distributed as small loans to households on an individual basis. Another possibility is that the local government facilitates villagers in gaining markets for their products, the benefits of which can be transferred to the villagers. Through this system, households are also encouraged to make small-scale savings and, as a result, a gradual mobilisation of credit within the community is developed.

Pioneered by Grameen in Bangladesh, micro-banking systems have already been implemented in over 25 countries in Latin America, Asia and the Pacific. In most cases the loans range between US$80-US$100. An estimated total of US$2.5 billion has already been successfully mobilised worldwide for these small scale loans, and repayment rates consistently exceed 90 per cent (World Bank 2002). This is now seen as an important way of helping poor communities and, in particular, it is seen as a way of empowering women in rural areas.

9.9. Promoting the agricultural ecosystem base

As discussed in Chapter 5, the agricultural production of these villages depends on the availability of soil nutrients in the forest area. Furthermore, the fertility of the soil in rice slash-and-burn fields is higher than in the fallow areas. This indicates that the availability of forest areas for rice production is crucial for the communities. This means that the conversion of forest for agricultural development will be continued if the technology and new systems are not adopted. This will reduce the forested land in this region.

As explained in Chapters 5 and 7, approximately every household in each of the three villages needs 1.4 hectares of forest land to ensure that rice production is available for a one year period, assuming that there is no crop failure. The forest land that is opened up for rice cultivation varies from one village to another, and it also varies from one household to another. This is influenced by the soil fertility and the number of household members. Thus, this system will not be maintained if the increasing population is not followed by the availability of the forest land. That said, this strategy has survived for many centuries and it has made the people self-sufficient rice producers as the number of inhabitants is small compared to the area of forest land they have.

I also found that the level of organic material in the farm soil was higher than the level in the forest soil, reflecting the short-term enriching effect of the slash-and-burn methods used here. Farmers generally acknowledged that every year they clear a plot of about one to two (average 1.4) hectares per family, with each plot being used for a period of two to three years. The cutting of the forest on the field is an annual event, performed in the dry season by the households in the villages, and the new fields are cleared either in new forest areas, or in the secondary forests.

This implies that in this type of slash-and-burn system, the fallow period for used plots needs to be very long (about 15 years according to farmers interviewed); much longer than the useful growing time for each piece of land. In spite of this, it does seem possible that a sustainable loop of slash-and-burn agriculture could be designed to cater for household needs, if each household was given a piece of land large enough to cover the fallow cycle (Weidelt 1998).

This could be calculated by the size of farmland holdings per household and divided by the duration of agricultural usefulness per field cut and then multiplied with the required fallow period per plot, plus the duration of usefulness (Rambo 1984; Weidelt 1998). Taking the average size of households farm of my study (calculated as 1.4 hectares), with a 15 year fallow period and a 2.5 year duration of usefulness, the area of a sustainable slash-and-burn system for the average household in my study would have to be 10.9 hectares. In a system such as this, at any one time, the majority of this land would be in various stages of fallow. However, this would result in a multi-aged stand of regenerated forest, which has been shown to promote higher levels of biodiversity in forest ecosystems.

Given the high degree of deforestation attributed to slash-and-burn farmers, the development of sustainable loop systems for communities could contribute to more sustainable management of forest resources. This is an area of research worthy of future investigation. Although these groups have frequently been blamed for deforestation, it has often been the case that their techniques have been misunderstood by migrant communities from other areas.[15] These people often have little or no knowledge of forest ecology and their only experience with farming techniques is practiced in completely different systems and under different topographic conditions. As a result, deforestation rates, particularly in transmigration areas along the highways of Pasir area have been alarmingly high, while at the same time, many farms have failed, and the settlers have moved on, encroaching further on the forest.

In order to promote a more sustainable approach to forest agriculture, however, it has become essential to change the approach to forest farming. Although to some extent, this process has begun with the adoption of permanent and agroforestry techniques, recent programs by the Paser District government to plant rubber with coffee and cacao is a new adoption of the agricultural model. One way in which this can possibly be brought about, is by incorporating the traditional farming skills with modern agriculture, and producing farm strategies that take account of both ecological and economic factors.

9.10. Contributing to the sustainability of Paser lifestyles through institutional change

In the part of Paser where my research was conducted, there is currently no shortage of forest land, although the land held by Paser people as 'reservations' or as 'protected', is both fixed, and legally defined. At the present time, although the Paser people are calling for their areas to be extended, it seems unlikely that they will be increased by the government in the foreseeable future. This inevitably means that as human population increases in the villages, pressure on forest land will increase, shortening the fallow periods, and eventually leading to soil degradation and other indicators of unsustainability. In order to address this possibility, it would be useful for policymakers to assess potential village size and determine land space requirements for these subsistence

15 Pasir District has been the major destination of the transmigration programme of Suharto's regime since the 1980s. In 2004, the total population of Pasir originating from transmigration was 98,000 people (Pasir BPS 2005). This programme has had a huge impact on the existence and development of palm oil companies, which were a major employer in this sector and also for the opening of forest area for new settlement and agriculture areas. Until recently, more than 375,000 hectares of primary forest in Pasir had been converted to palm oil, timber estates, agriculture development and for new settlements.

communities by considering population growth, technological development and soil fertility. Furthermore, given the degree of self-sufficiency of households in this study, this estimate of land space requirement could provide a basis for the calculation of a sustainability indicator, such as an 'ecological footprint' (Wackernagel & Rees 1996).

9.11 Policy strategies for sustainability

One of the main objectives of this study is to find possible interventions to improve the income from NTFPs for the local people. This is in line with the findings in previous chapters that non-timber forest products are valuable commodities, not just in the monetary sense, but also in the sense of social and cultural significance. It is hoped that this information will be used by policymakers, not only in Paser, but in other forested areas of the country. If this does occur, it may be possible to develop more sustainable forest management strategies, This would allow local people to capitalise on the wealth of their resources, by increasing value added and by securing potential income streams for future generations.

One of the main issues raised by the respondents during the research period was the property rights of local people over the resources and, in particular, in respect o the rattan gardens and wild honey trees. A lack of appreciation of the indigenous people's rights to these resources has influenced the management and the sustainability of these resources and, ultimately, affected the livelihoods of this community. It was problematic for communities when the resource use rights of some wild honey trees were transferred to the government or other groups, like logging concessions.

Some possible interventions that could contribute to a real eradication of poverty in these areas are*:*

- *The policy intervention*, which would legalize the traditional rights to rattan gardens and wild honey trees. The envisioned implication of this policy change is to reduce the costs of handling and transporting rattan canes, abolishing the use of licences to transport rattan canes, and to declare this product as a non-regulated commodity like other agricultural products. In addition, it would abolish the forestry levies (tax) on raw rattan canes coming from cultivated gardens. This means that the central government has to change its perception that rattan products from this region do not count as the products of natural growth; rather, that they are a product of small-holder rattan cultivation. The same provision would also give local people access to logging concessions in order to collect and maintain wild honey trees. The users should feel free to enter the concession area and secure their right to harvest honey from these trees. The most important thing is to promote legal sanctions and to punish concession holders who have felled wild honey trees.
- *Bridging the market:* many products failed to reach the market as a result of low accessibility to market centres or because of the high costs of transportation.

The provision of affordable, better local and regional transportation for both passengers and freight would improve the quality of life in forest village households. However, care must also be taken, since in many cases market accessibility is often followed by overexploitation of forest resources, as in the case of the collection of birds' nests and *gaharu* or eaglewood. Presumably this will not be the case for those products where the management and production system is known by local people, such as for rattan and domesticated fruits.

- *The development of local industries* is another way to bridge the distance to the market. Developing an industrial base for the exploitation and processing of NTFPs would provide employment opportunities and reduce the cost of NTFP marketing. This could include the processing and packaging of rattan, handicrafts, 'bush teas', herbs, coffee, medicinal plants and forest fruit processing.
- *Improving the knowledge:* an inventory of resource knowledge appears to be very important for forest dwelling people. This will tell them what products they have, where the products can be found and at what time this product can be collected or harvested. The aim of improved management approaches is to determine the full potential of a resource and to allow the people to develop a tentative harvest schedule during the period of one year. This effort is important to secure their annual income source and to maintain product availability, thus preventing any difficulties in case of crop failure or market shortages. It would also deal with the current conservation status, because the villagers often think that certain products may still be available, even though their stocks have | been greatly diminished. This is likely to happen when villagers are not used to any monitoring or recording system. This is another way to reduce the vulnerability of income from a high variety of resources, different seasonality and small amounts of harvesting volume. This type of knowledge will also enable them to make a plan for better marketing and to predict the outcome of the harvesting. Many traders cease to buy products because the volume is unpredictable, due to the absence of documentation. It is also important to introduce knowledge about improved and new designs for handicraft products that follow market trends. Another important aspect is the provision of technical assistance in rattan processing and handling. All this will contribute to the sustainability of this resource and the economy of the villagers.
- Another important aspect is the maintenance and the transfer of traditional knowledge to the younger generations. It is hard to find members of the younger generation who are interested in learning about the traditional knowledge (such as knowledge related to medicinal plants, planting rattan, and management of wild honey trees). They view this lifestyle as belonging to a 'backward' culture and the symbols of poverty have stimulated them to leave their own cultural heritage and become a demanding generation looking

for industrial products, something that makes them heavily dependent on generating a cash income.

- *Workshops* to disseminate the principles of sustainability, which enable some integration of traditional and scientific knowledge, would be another way of convincing the new generation that life can be better if they are willing to learn their own cultural values and combine it with scientific knowledge.

9.12. Direction for further research

In response to the controversial paper on ecosystem values by Constanza et al. (1998), Opschoor (1998) and Godoy (1989) have pointed out that there is much need for additional research 'especially in the area of methodology'. Although the study outlined here has made some contribution to this methodology debate (see Chapter 3), there are still many aspects that need further research. One possible direction for this would be to apply this methodology elsewhere, as a means of assessing values for other types of environmental attributes. Furthermore, this study has shown the benefit of including qualitative data alongside quantitative, and more work needs to be done on methods to integrate the different types of data more fully. One way in which this can be done is through the use of *Multi-Criteria-Analysis*, and again this is an important area to which further research could be directed.

There are a number of possible areas of further research into development strategies utilising non-timber forest products. For example, research is needed into the application of indigenous forest plants as insecticides, and this could be conducted in a participatory manner, with field trials in villages. Other work could investigate the potential for the marketing and export of exotic products such as orchids or medicinal plants, which are found within forest areas. Domestication of local species for meat production could produce sustainable income flows from both local sales and exports, but research would need to be conducted into the feasibility of such a project.

Some indications of local farmers' willingness towards such novel approaches to agricultural development are indicated by the interview results shown in Chapter 8. 67 per cent of the households would be interested in trying new crops on their farms, while 12 per cent stated that they would not be interested. If such projects proved to be successful, they could contribute both to securing better household incomes and more sustainable use of forest resources.

Opportunities for the development of ecotourism in the area should be examined. From the qualitative data collected during the study, an examination of people's perception of this development option indicated that tourism is perceived as relatively positive. Although people generally did not currently consider it to be important for their family, they did feel that it could be important in their children's lifetime. In this area, developments in ecotourism could include such things as the provision of adventure travel and rafting, wildlife watching and photography, and cultural performances such as honey harvesting. All of these activities would generate employment and income, both locally and nationally. In order to achieve the greatest degree of local benefit however, such developments would have to be organised on the basis of participatory management, designed to keep within the carrying capacity of the environment in the area, and incorporated as part of a regional strategy for ecotourism development in Paser.

The term 'forest functions' used in this study actually refers to the products and services provided by the forest. Attempts to place a monetary value on these have been discussed in Chapters 6 and 7, and they have been compared with other research results (as shown at the beginning of this chapter). Based on these findings, I conclude that a total valuation of the forest ecosystem and its products is difficult if not impossible. In order to gain a greater insight, much more work needs to be done to investigate both the nature and the value of such services. In addition, further research into the important area of carbon sequestration values is recommended (Kishor & Constantino 1993; Pearce 1996). One other possible area of research in this region, which may be useful, would be to compare the perceptions of policymakers to forest functions with those indicated by indigenous Paser people, as shown in Chapter 8. Through analysis of the differences in perception, possible reasons for policy failures may be identified, and also a broader understanding of the meaning of the term 'forest functions' may be developed.

9.13. Conclusions

This study has demonstrated a method of assessment of the actual use values of non-timber forest products in monetary terms. In addition, it has incorporated other qualitative aspects of value, to illustrate the need to broaden the utilitarian concept of value currently favoured by economists and policymakers. If survival of forest communities and their ecosystems is to be achieved, it is important that non-monetary values must be respected, and since it is realised that timescales commonly used in economic analysis are usually far shorter than those relevant to ecological cycles, the need has arisen to reassess the ways in which we perceive the world and its resources, as well as the way we make our decisions about their use. Clearly, this has serious implications for conventional neo-classical economies, and suggests that the time has come to accept some degree of paradigm shift within the discipline.

The calculated figures for the use value of NTFPs and the ecological services in these villages actually represent the value added to labour and capital inputs by the use of the primary resource, land and forest. This amount, therefore, is equivalent to the rent of that factor of production. This figure is not insignificant, and it would certainly be important to include such rents in any assessments of alternative development strategies. Since exploitation of the natural capital in these villages is small-scale and considered to be non-depleting, it is not necessary, as part of this analysis, to depreciate the value of the natural capital use. The important factor to consider in this case, however, is the fact that the estimated level of rent accruing to land and nature, as a result of the use of NTFPs and their services is, *ceteris paribus*, an infinite income stream. It has significant implications for sustainability and it is important that, if the quality of the income stream is to be preserved, action must be taken to ensure that this communal property resource is not depleted by the decisions and actions of both the local residents and the policymakers of the current generation.

Estimates such as these could be used as an indicator of the amount of compensation that would need to be paid in the event of such villages losing their access to the forest as a household. Such a situation may arise, for example, in a location which is to be taken over for the purpose of developing a timber estate and palm oil in the research area. In other villages, a logging concession or an oil palm plantation was established, resulting in the loss of access to this common property resource. These figures, when combined with estimated timber values (from the concession), could also be used for the purpose of evaluating the cost of an oil palm plantation, a forest fire, flooding, or other ecological disruption. There is no doubt from this analysis that the importance of NTFPs has not been highlighted in the government programme for forest timber cutting and for the development of palm oil industries. People in these villages would be significantly worse off if no forest existed for their use, and the data show that the existence of the forest is important for food security in forest villages such as these. In addition, the role of non-timber forest products is essential to the lifestyle of the forest dwellers. Without this contribution, the way of life of Paser people would be unsupportable. It also suggests that it should certainly be in the interest of the Pasir District policymakers to look more carefully at the total forest income potentials, rather than concentrating solely on the timber income potentials of forest resources.

In spite of the undeniable role of NTFPs, timber is commercially the most important product in this region. As much as NTFPs tend to be the poor person's lot, the benefits from timber often seem to be captured only by the company or by people holding positions of power or authority. The main reason for this is that indigenous people's involvement in the utilisation, as well as in the benefit sharing, of timber extraction was not taken into account by the government in the allocation of the forest area for logging concessions.

My analysis also confirms that different perceptions of forest functions between and within the villages and among gender and other groups do exist. All of these differences between the groups studied here could be examined in much greater detail, with a number of alternative statistical tests, but this is beyond the scope of this work. Nevertheless, it has been shown that variations in social values do exist, and these are likely to influence people's behaviour and attitudes to their environment and forest conditions.

On the basis of the accounting methodology used here, in each of the villages, the proportion of output accounted for by forest inputs is not unimportant. Therefore, even taking into account any error, the value added from nature, as demonstrated by this analysis, is quite significant.

Recognition of the importance of non-economic or socio-cultural capital serves to highlight the need to incorporate all groups within society in the valuation process. This is essential as a means of ensuring that the interests of all stakeholders are represented, and that all aspects of value are included. In order to include a wide range of information into the decision-making process, the use of multi-criteria analysis is recommended as a viable alternative to the narrower cost-benefit analysis and contingent valuation methods commonly used today. By incorporating traditional knowledge with a wider range of data from a variety of disciplines such as ecology, hydrology and economics, a much broader knowledge base can be developed, possibly resulting in more meaningful policy decisions. This is one important direction for future research but, hopefully, by increasing our knowledge of forest use today, this study has firstly broadened our knowledge base and, in the long run, it will contribute both to the empowerment of local forest dwelling people and to the achievement of more sustainable strategies of tropical forest management.

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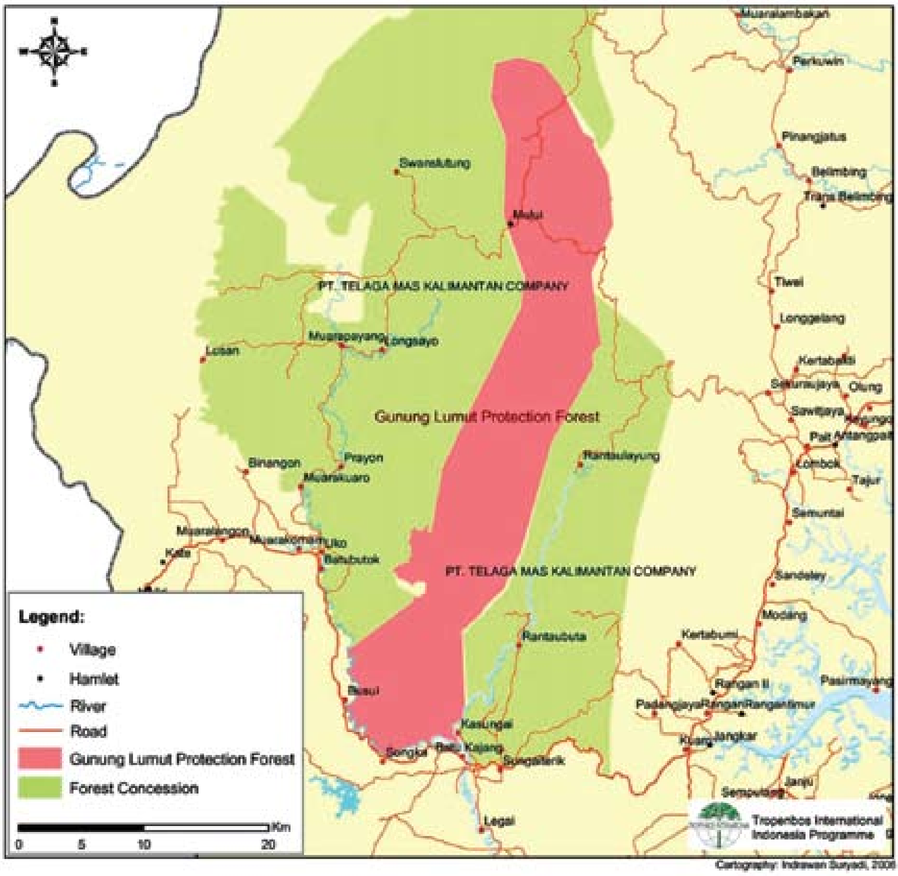
Appendix



Appendix 1 Gunung Lumut Protection Forest (red) and logging concessions area (green).

Appendix 2. The production of timber and non timber products in Pasir (1992-2006)

Comodity	1992	1993	1994	1995	2000	2001	2002	2003	2005	2006
Sawn timber (M3)	375	946	41269	69473	645	0	890	8127	34550	1927
Ulin (logs) (m3)	36	32	294	859	0	0	0	0	0	4801
Sirap ulin, (pieces)	85000	85000	57500	156000	0	0	0	60000	529000	370000
Rotan (ton)	468	429	663	6093	720260	509605	530	611	168	43
Madu (kg)	600	0	0	10335	0	0	0	0	0	0
Sarang burung (kg)	90	40	36	6	0	0	0	0	0	0
Kemedangan (kg)	805	470	50	17636	0	0	0	0	0	0
Rotan semembu (piece)	?	?	?	?	?	5018	6857	11009	24966	4200
Coffee (ton)	?	?	?	?	?	1140	1205	1256	1334	1435
Rubber (ton)			2516	3532	4590	3387	3726	5264	5419	7802
Palm wine (ton)						23	24	26	26	27
Kayu gaharu (kg)	86	22	0	3920	0	0	0	0	0	0
Sirap production in 2002 to 2004 is : 0;0;400,000 pieces.										

Source : BPS Kabupaten Pasir, 2003 and 2006

Appendix 3. The description of prominent NTFPs in research villages

The following is a briefly describing 21 most prominent NTFPs which occur in research area. Species or relevant products groups have been selected which are considered important for commerce or subsistence. The list is in alphabetical order of the Indonesian (trade) name. Information is given about:

1. Name in Bahasa Indonesia (BI)—vernacular name used in Rantau Layung (RL) or Pinang Jatus (PJ) –English trade name or literal translation
2. Scientific name of the forest species providing the final products (s)
3. Main use
4. Marketing level (export, province, locally)
5. Occurrence and abundance in the research area as perceived by local informants
6. Products is bought, sold or collected exclusively for subsistence
7. Cultural value can be attributed
8. Management of harvesting technique practiced
9. Selection for cultivation or not
10. Substitutes used
11. Other remarks

<u>Akar emplas (RL), Aka Preq (PJ), ("sand paper liana")</u>

Sc.name	: *Tetracera scandes*
Use	: abundant cell water drubk as refreshment or used as eye drops
Occur. And abund.	: (+), rela. Frequent
Marketing level	: (-)
Bought or sold	: RL (-), PJ (-)
Subsistence used	: RL (+), PJ (+), (in the forest only)
Cultural value	: RL (-), PJ (-)
Harvest tech.	: indiv, destructive
Cultivated	: RL (-), PJ (-)
Substitute/alternative on disturbed sites	: Aka Kelawit (RL) (*Uncaria longifolia*) growing
Remarks	: the leaves were used as sand paper, now substituted thereby

Bulu, gigi, kulit dan tanduk binatang (BI), (trophies):

Primarily feathers	: Argus Pheasant (1) and hornbills (2); fangs and skins from predators (e.g. Malayan sun bear, wild cats, civets) (3); the scaly skin from pengulin (4); deer antlers (5)
Sc. names	: *Argusianus argus* (1), *Helarctos malayanus* and others (2), several species of felidae (3), *Manis javanica* (4), *Cervus unicolor* and *Muntiacus muntjak* (5)

Uses	: feathers and skins are used in traditional dancing costumes; fangs as decoration for baby carriers; antlers and pengulin skin as wall decoration; meat of all these animals is eaten
Occur. And abund.	: (+), rare
Marketing level	: locally, province
Boght or sold	: RL (+), PJ (substitutes bought)
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (+), PJ (+)
Harvesting tech.	: individual and destructive, possible population depletive. Animal is killed, no “close season”, no taboos, no attempt to distinguish and spare certain species or gravid females
Substitution/alter.	: plastics fang and paper feathers
Remarks	: only hornbill are hunted for their feathers, all other animals are trapped “accidentally” while hunting for game. The cultural value especially of feathers and fang is very high and animlas are getting rare. Most trophies encountered are old and inherited. High demand for (expensive substitutes). Most of these species are internationally protected

Cempedak (BI), (also” cempedak”), kind of fruit somewhat similar to jackfruit)

Sc.name	: *Artocarpus integer*
Use	: fruit eaten
Occur.and abund.	: (+), rel.frequent
Marketing level	: local, provincial
Bought or sold	: RL (-), PJ (-)
Subsistence use	: RL (+), PJ (+)
Cultural value	: (RL (-), PJ (-)
Harvesting tech.	: non-destructive; cauliflorous fruit are easily picked off the trunk
Cultivated	: RL (+), PJ (-)
Remarks	: Fruit is small as compared with jackfruit, planted in fallow or close to village

Daging (BI), (game) : primarily deer “rusa” (1), “Kijang” (2), “kancil” (4)

Sc. Name	: *Cervus unicolor* (1), *Muntiacus muntjak* (2), *Tragulus javanicus* (3)
Use	: meat eaten
Occur.and abund.	: (+), frequent
Marketing level	: Locally (district)
Bought or sold	: RL (+), PJ (+)
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (high), PJ (high)

Harvesting tech.	:	individual, destructive, possible population depletive. Animal is killed, no "close season", nop taboos, no attempt to distinguish and spare certain species or gravid females (catching a latter is lucky!, two in one)
Cultivated	:	RL (-), PJ (-)
Substitute/alter.	:	domesticated chicken and fish
Remarkas	:	domesticated chicken are raised primarily as "saving" for family festivies in case hunt isd not lucky. The Paser craze for hunting deers is the most obvious cultural religious difference distinguishing from Christians (i.e. Paser vs. "intruding" timor and toraja for hunting wild boar.

<u>Damar (BI), hardened resins)</u>

Sc.name	:	*Shorea, Parashorea, Hopea, Dipterocarpus*
Use	:	naturally exuded and hardened resin used for caulking boats
Occur.and abund.	:	(+), plenty
Marketing level	:	(-)
Bought or sold	:	RL (-), PJ (-)
Sunsistence use	:	RL (+), PJ (+)
Cultural value	:	RL (-), PJ (-)
Harvesting tech.	:	non-destructive; huge clumps of hardened resin fall off formerly damaged tree parts and are easily picked off the ground
Cultivated	:	RL (-), PJ (-)
Subsistence/alt.	:	oil-fuel, candle
Remarks	:	up to second world war different kind of damar were used in large amounts in lacquer and varnish industry. A speciality market exists, served e.g. by old small holder plantations in Sumatra. Different qualities (depending on tree species and product quality) are distinguished but not in research area. Low quality of damar is abundant and easy to collect so no local market develops for local use (see also, Syafruddin et al., 1994)

<u>Daun Biru (BI), ("Blue leaf", licuala palm leaf)</u>

Sc.name	:	*Licuala spinosa*
Use	:	young leaves for hat making "seraung" old leaves for roofing, wrapping, and cooking traditrional foods
Occur.and abund.	:	RL (+) in primary forest, PJ (+) rel.frequent
Marketing level	:	RL (-), PJ (-)
Bought or sold	:	RL (-), PJ (-)

Cultural value	:	RL (+) very high, PJ (+) very high
Harvesting tech.	:	non destructive, the very short stemmed licuala palm produces only one new ;eaf at a time. Cutting this one central folded leaf used for hat making does not harm the palm much. Cutting of all good older leaves for roofing most probably inhibits growth for a while but does not kill the plant.
Cultivated	:	RL (-), PJ (-)
Substitution/alter.	:	dep.on use ; leaves of Ziniberaceae (young secondary forest), pandanaceae (planted in swampy areas), Nypah fruticans (secondary forest, esp. in brackwish water, shingles traded upriver), plastic canvas, corrugated iron (roofing)—none (for hats and food aid)
Remarks	:	no interview partner had ever though about planting licuala or had any idea if how) that would work. Using L. leaves as roofing material for farm huts is considered typical for RL not for PJ.

Daun Mekai (BI), Usen Udu (RL), ("Mekai leaf"

Sc.name	:	*Alestesia papuana* (?) (a small liana)
Use	:	dried leaves used as a condiment
Occur.and abund.	:	RL (+), PJ (+) but in frequent
Marketing level	:	-
Subsistence use	:	RL (+), PJ (+)
Bought or sold	:	RL (-), PJ (-)
Cultural value	:	RL (-), PJ (-)
Harvesting tech.	:	non-destructive for mature lianas; all leaves within reach are stripped off the stem
Cultivated	:	RL (-), PJ (-)
Substitute/alter.	:	salt, "pexin" (monosodium glutamate)
Remarks	:	Today "mekai" leaf are uased in primarily one dish by the Dayak Kenyah.

Gaharu (BI), Sekau (RL), (Aloe wood or Eagle wood)

Sc.name	:	Aquilaria beccariana (possl. Also A. malaccencis and Gonystylus spp.)
Use	:	presumably fungus infected wood with black cell fillings is used in perfumes and incense wood
Occur.and abund.	:	RL (rare), PJ (rare)
Marketing level	:	export
Bought or sold	:	RL (+), PJ (+)
Subsistence use	:	RL (-), PJ (-)

Cultural value	: RL (-), PJ (-)
Substitute/alter	: (-)
Remarks	: Gaharu has been traded for centuries"from Borneo" but is actually limited to higher mountain ranges; currently highly priced; the Gunung Lumut Forest Areas was major supplier of Gaharu during 1980s from Pasir Dsitrict from the species of *A. malaccencis* and *Gonystylus spp* (Semok and Saruntung pers.comm., 2005).

Madu (BI), RL (wani), Honey bees

Sc.name	: Apis dorsata
Use	: sweetener
Occur.and abund.	: RL;frequent; PJ ;frequent
Marketing level	: local
Bought or sold	: RL (Sold), PJ (Sold)
Cultural value	: RL (+), PJ (+)
Substitutes	: sugar cane, palm wine, and sugar
Remarks	: honey bees are harvested during dry season in October to December, the bees are hanging in 3 species of timber (Koompalsi spp), well distributed in forest area of Rantau Layung and Pinang Jatus. The production of honey seems to be available only for certain period of time. Collectors of honey in RL informed that the production period could takes once in four years.

Ipuh (BI), Upas (RL), Dart Poison

Sc.name	: Antiaris toxicaria
Use	: latex prepared into dart poison
Occur.and abund	: RL (+) rare, PJ (-)
Bought or sold	: RL (-), PJ (-)
Subsistence use	: RL (+), PJ (-)
Harvesting tech.	: non destructive; the bark is cut like tapping rubber
Cultivated	: RL (-), PJ (-)
Substitute/alt.	: (shot guns, air guns)
Remarks	: the tree is very rare in the area but the few trees in the surrounding RL close to Gunung Lumut Forest Protection are known to many.

Kayu bawang (BI), Ja'ui (RL), (Garlic tree)

Sc.name	: *Scorodocarpus borneensis*
Use	: seed use as a condiment (tasting a bit like old garlic-onions)

Occur.and abund.	: (+), rel. frequent
Marketing level	: (-)
Bought or sold	: RL (-), PJ (-)
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (-), PJ (-)
Harvesting tech.	: non-destructive; fruits are small nuts with a hard shell falling of the tree when ripe
Cultivated	: RL (-), PJ (-)
Substitute/alter.	: onions, garlic
Remarks	: its subsistence value has declined since the availability of onions and garlic. All men interview partners from RL dislike the taste while woman like it.

<u>Kayu lem (BI), ('glue tree")</u>

Sc.name	: Acronychia spp (3 species undifferentiated by informants)
Use	: Latex rich bark used in industry as base for incense sticks and mosquito coils
Occur.and abund.	: alluvial or swampy forest areas in a river side
Marketing	: export
Subsistence value	: RL (+), PJ (-)
Cultural value	: RL (-), PJ (-)
Harvesting tech.	: indiv. Destructive; trees are felled, trunk and larger branches then debarked. As only felled trees dbh>20 cm have been observed regeneration with juvenile thinner bark may keep up at least the next generation.
Cultivated	: RL (-), PJ (-)
Subsistence/alter.	: (-)
Remarks	: occurrence in swampy areas down river from RL, low price, collected in villages down river since 1994, harvestable stock almost depleted.

<u>Malau (BI), Tekipai (RL, PJ), Gutta Percha</u>

Sc.name	: *Palaqium gutta, P. leiocarpum, P.calophyllum, Payena acuminata*
Use	: coagulated latex used as fixation e.g. of tool blades to handles
Occur.and abund.	: RL (+), rel. frequent
Marketing level	: province
Bought or sold	: RL (-), PJ (+)
Cultural value	: RL (-), PJ (-)
Harvesting tech.	: indiv.destructive trees are felled and tapped in deep ring cuts approximately every 60cm along the trunk. Juvenile trees semm to be spared due to scarce latex production

Cultivated	: RL (-), PJ (-)
Substitute/alter.	: other fruit
Remarks	: in its high times Gutta Percha was used as insulator for submarine telegraphy cables substituted today by satellite technology. Up today golf balls are made from Gutta Percha. Most other uses (industrial and subsistence) are substituted by different kinds of plastic.

<u>Pasak Bumi (BI), ("peg of the world")</u>

Sc. name	: *Eurycoma longifolia*
Use	: infusion of tap roots drunk by men as aphrodisiac or against "back aches"
Occur.and abund.	: rare (over exploit in the past)
Marketing level	: province
Bought or sold	: RL (sold), PJ (-)
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (-), PJ (-)
Harvesting tech.	: individual destructive; to obtain the straight tap roots as long as possible the whole (small) trees is pulled out of usually sandy soils. Non information was available on maximum size or size at maturity.
Substitute/alter.	: (-)
Remarks	: the use of "Pasak Bumi" is a Kutai tradition relatively new to the Dayaks but imitated by young bachelors (Grossman, 1997). In Samarinda (the province capital), cups made of root wood and chips are sold in souvenir shops and on the nigh market.

<u>Petai hutan (BI), "petai beans"</u>

Sc.name	: *Parkia speciosa*
Use	: seeds eaten as condiment or snack
Occur.and abund.	: RL (+), PJ (+) Infrequent
Marketing level	: local and district level
Bought or sold	: RL (+), PJ (+) both sold
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (-), PJ (-)
Harvesting tech.	: individual destructive; mature trees are considered too high for climbing, the overstory tree is felled to obtain not fully ripened pods growing on twig tips
Cultivated	: RL (-), PJ (-)
Substitutes/alter.	: petai cina (BI); beta alo' (RL), cultivated tree bearing similar but much smaller pods and seeds (*Leucaena glauca*)

Rotan (BI), Rattan :

<u>Small-diameter size: Rattan segah, Jahab,Ttohiti, Seringan</u>

Sc.name	:	*Calamus caecius, Calamus trachycoleus, Daemonorops crinita*,
Use	:	canes used in basketry and other handicraft growing tips of many species are used as vegetable or condiment (like bamboo shoots but very bitter)
Occur.and abund.	:	RL and PJ is frequent
Marketing level	:	provincial and export
Bought or sold	:	RL and PJ both sold
Harvesting tech.	:	not destructive for clustering species (all above) but cut half meter above the ground; commercial collectors in natural forest seem not to adhere to this rule
Cultivated	:	RL;sega and jahab, PJ; Sega
Substitute/alter.	:	dep.on use; plastic and nylon cords; wire; plastic mats, nails; etc.
Remarks	:	these rattan species are found in old productive garden and established as small cultivation in the village of Rantau Layung and Pinang Jatus

<u>Large Diameter Rattan</u>

Rotan semambu (BI)

Sc.name	:	Calamus scipionum
Use	:	furniture making (frame)
Occur.and abund.	:	rare
Subsistence use	:	RL (-), PJ (-)
Marketing level	:	province and inter-province
Bought or sold	:	RL (-) PJ (-)
Cultural value	:	RL (-), PJ(-)
Harvesting tech.	:	individual destructive,solitary species
Cultivated	:	RL (-), PJ (-)
Substitute/alter.	:	-
Remarks	:	since 1984 the collection of semambu had been intensively conducted by outsiders as well as the people of RL and PJ, this caused the depletion of this species in research area and there is no significant cultivation as compared with rattan segah (Lawut and Semok, pers.comm, 2005)

<u>Sarang Burung (BI), edible birds nest</u>

Sc.name	:	*Collocalia fuchiphaga, C. vestita* (different cave nesting swifts)
Use	:	eaten in Chinese"bird nest soup"
Occur,and abund.	:	RL (rare), PJ (-)
Marketing level	:	export
Subsistence use	:	RL (-), PJ (-)
Cultural value	:	RL (-), PJ (+)
Harvesting tech.	:	theoretically non destructive to a live individual, practically population depletive; the nests made of hardened saliva are sticking to cave ceilings and walls. They could be scrapped off twice before eggs are laid if then a full breeding phase is made possible.
Cultivated	:	RL (-), PJ (-)
Substitute	:	-
Remarks	:	very high price; a few nesting cave known in the mountain region of RL and Muara Komam (the village near by), Saruntung a former birnests collectors informed that the collection of birdnests was main business in the region during 80s and today only few caves produced birdnests. (totally there are 36 caves produced birdnests in Pasir District and majority of them found in Gunung Lumut and Beratus mountain region, Pasir Forest Dept. 2005).

<u>Suling (RL), no BI or English name known</u>

Sc.name	:	*Eugenia tawahense* (?) *Eugenia spp*. (two species used)
Use	:	gluey dark red latex the bark used as red dye and insecticide on items made of split bamboo
Occ.and abund.	:	rel. frequent in RL, PJ (-)
Bought or sold	:	RL (-), PJ (-)
Cultural value	:	RL (+), PJ (-)
Subsistence value	:	RL (+), PJ (-)
Harvesting tech.	:	non destructive
Cultivated	:	RL (-), PJ (-)
Substitute/alter.	:	-
Remarks	:	if only part of the bark used (only small quantities are needed) the tree lives on. If large quantities are needed the tree is felled and debarked.

<u>Tengkawang (BI), illipe nuts</u>

Sc.name	: 16 *shorea spp*
Use	: seeds or "nuts" exported for their fat (a chocolate butter substitute)
Occur.and abund.	: plenty of Shorea spp(Meranti) but only few bearing small commercial nuts
Marketing level	: province (West Kalimantan and Sarawak)
Bought or sold	: RL (-), PJ (-)
Subsistence use	: RL (-), PJ (-)
Cultural value	: (-)
Harvesting tech.	: non destructive
Cultivated	: RL (-), PJ (-)
Remarks	: very irregular fruiting (appr. Twice a decade; high speciality market with limited demand. Shorea species with largest seed (Shorea macrophylla) occurring and cultivated in West Kalimantan and Sarawak, not endemic to East Kalimantan (Grossmann, 1992; Wong, 1988).

<u>Bamboo (BI), Buluh (RL)</u>

Sc.name	: 6 Bambusa spp (all cluster species)
Use	: canes are used for various handicrafts and agriculture tools, animal and poultry cages
Occur. And abund.	: plenty but not marketing and used for subsistence only
Merketing level	: -
Bought or sold	: RL (-), PJ (-)
Subsistence use	: RL (+), PJ (+)
Cultural value	: RL (+), PJ(+)
Harvesting technique	: non-destructive
Cultivated	: RL (+), PJ(+)
Remarks	: bamboo is the most importance NTFPs for agriculture tools and development, it is used for fencing, construction village hut, and also use as fuelwood, and as vegetables (roots). Used as stick for climbing plants vegetables, etc.

Appendix 4 The most commercial fruits on sale in major market in Simpang Pait, in 2004-2006.

Scientific name	Vernacular name	Season	Price Rp.	Origin	Status	Importance
Artocarpus integer (Thunb.) Merr.	Cempedak	Nov.-March	2,000-2,500/kg	RL,PJ,O	Cult.	Regularly
Archidendron jiringa (Jack) Nielson	Jengkol	All year	1,500-2000/kg	PJ,O	Clut.	Regularly
Artocarpus lanceifolus Roxb.	Keledang	Febr-March	500/fruit	RL,PJ,O	Forest	Occasionally
Baccaurea macrocarpa (Miq.)	Kapul	Febr-March	1,500-2000/kg	RL,O	Forest	Occasionally
Baccaurea motleyana Mull	Rambai	Febr-April	500-750/kg	RL,PJ,O	Cult.	Regularly
Dimocarpus longan Loureiro	Mata Kucing	Jan-March	3,000-4,500/kg	RL,PJ,O	Forest	Occasionally
Durio kutejensis (Hassk.) Becc.	Lai	Dec-March	2,500-3,000/fruit	RL,PJ,ML,O	Forest	Regularly
Durio bulcis	Lahung/layung	Dec-April	2,000-3,000/fruit	RL,PJ,ML,O	Forest	Regularly
Durio zibethinus Murray	Durian	Dec-March	5,000-7,500/fruit	RL,PJ,ML,O	Forest	Regularly
Garcinia dulcis (Roxb.) Kurz	Asam Kandis	March-July	6,000-8,000/kg	RL,O	Cult.	Occasionally
Garcinia mangostana L.	Manggis	Dec-March	500-1,000/fruit	PJ,O	Cult.	Regularly
Lansium domesticum Correa	Langsat	Dec-March	3,000-5,000/kg	RL,PJ,O	Forest/cult.	Regularly
Mangifera caesia Jack	Wanyi	Jan-febr.	1,500-2,000/kg	RL,PJ,O	Cult.	Occasionally
Nephelium lappaceum L.	Rambutan	Jan-March	750-1,000/kg	RL,PJ,O	Cult.	Regularly
Parkia speciosa Hassk.	Petai	All year	500-750/pod	RL,PJ,ML,O	Forest/cult.	Regularly
Pangium edule Reinw.	Kluwak	All year	3,000/kg	RL,PJ,O	Forest	Occasionally
Sandoricum koetjape (Burm.f.)Merr.	Kecapi	Jan-March	150-250/fruit	PJ,O	Forest	Occasionally
RL= Rantau layung, PJ=Pinang Jatus, ML=Muluy, O=other regions, Cult. = cultivated.						

Appendix 5.1 List of plants used for building material by the indigenous people of Paser in Rantau Layung

No	Family	Name	Local name	habitat	Plant part	Source	Main uses
1	Araucariaceae	Agathis borneensis	Kayu tumuh	tree	wood	Tana alas, awa umo	Wall, floor, gilder, joist, rafter,lath,door,window
2	Apocynaceae	*Alstonia angustiloba*	Kayu angah	tree	wood	Tana alas, awa umo	Wall, floor, window, door
3	Arecaceae	*Arenga brevipes*	deramah	tree	leaves	Tana alas,Laou lati, L. Piara	Roof (hut, chicken hoop)
4	Anacardiaceae	*Campnosperma sp*	Telatang	tree	wood	Tana alas,	Floor, girder,joist,rafter (hut)
5	Annonaceae	*Cyatocalix sp*	Pelinitan	tree	wood	Tana alas	Floor, girder,rafter,lath(hut)
6	Arecaceae	*Eugeissona utilis*	Kinangan	Palm	leaves	Tana lati, piara,	Roof
7	Annonaceae	*Xylopia altisima*	Kayu bako	tree	wood	Tana alas, lati piara	Wall, floor, girder
8	Annonaceae	*Xylopia* sp	Kayu sia	tree	wood	Tana alas	Wall, gilder, joist
9	Arecaceae	*Calamus sp ?*	Uwe buluk	rattan	cane	Lati piara, tana alas	Binder (hut)
10	Arecaceae	*Calamus sp?*	Uwe lasaat	rattan	cane	Lati piara, lou lati	Binder (hut)
11	Arecaceae	*Calamus sp ?*	Uwe lasung	rattan	cane	Lati piara, lou lati	Binder
12	Arecaceae	*Daemonorops sabut*	Uwe lingan	rattan	cane	Lati piara, tnan alas	Binder
13	Arecaceae	*Calamus* sp	Uwe seet	rattan	cane	Lati piara, lou lati	Binder
14	Areacacea	*Daemonorops* sp	Uwe fetari	rattan	cane	Tana alas, lati piara	Binder
15	Arecaceae	*Calamus* sp	Uwe putek	rattan	cane	Tana alas, lati piara	Binder
16	Arecaceae	*Calamus* sp	Uwe rabun	rattan	cane	Tana lati, tana alas	Binder
17	Bombacaceae	*Durio* sp	Durian	Tree	Wood	Tana alas, lati piara	Joist,girder,wall,floor,lath,door
18	Bombacaceae	*Durio* sp	D. belalah	tree	Wood	Tana alas,	Joist, girder,wall,floor,lath,door
19	Burseraceae	*Canarium* sp	Uled	Tree	Wood	Tana alas, awa umo,L. piara	Wall,floor,girder,rafter,lath,door
20	Casuarinaceae	*Gymnostema sumatrana*	Kayu aru	Tree	Wood	Tana alas, awa umo,	Wall, floor, door, joist, ginder
21	Clusiaceae	*Calophyllum* sp	Bitor	tree	wood	Tana alas, tana ekang,	Floor,wall,lath,window,door

No	Family	Name	Local name	habitat	Plant part	Source	Main uses
22	Clusiaceae	*Garcinia cowa*	Kazi	Tree	Wood	Tana alas, tana ekang	Pole (hut)
23	Clusiaceae	*Garcinia* sp	Ketung	Tree	Wood	Tana alas, tana ekang	Poles,floor,girder,rafter(hut)
24	Dipterocarpaceae	*Shorea* sp	Kayu narit	Tree	Wood	Tana alas, lou lati,t. ekang	Wall, floor, girder,lath,door,
25	Dipterocarpaceae	*Anisoptera marginata*	Kubong nalo	Tree	Wood	Tana alas, T. ekang	Wall, floor,joist,door, window
26	Elaeocarpaceae	*Elaeocarpus* sp	Kayu dapur	Tree	Wood	Tana alas, lati piara,T. ekang	Wall,floor,joist,door,window
27	Elaeocarpaceae	*Elaeocarpus* sp	K. Serudang	Tree	Wood	Tana alas, lati piara, ekang	Floor, girder, joist, rafter
28	Euphorbiaceae	*Macaranga triloba*	Binasing	Tree	Wood	Lati piara, lau lati, awa umo	Floor, pole, joist(hut)
29	Euphorbiaceae	*Trigonopleura malayana*	Ganed fate	Tree	Wood	Tana alas, T. Ekang, awa umo	Floor, wall, ginder, rafter
30	Euphorbiaceae	*Macaranga* sp	Minir	Tree	Wood	Lati piara, awa umo, L.Lati	Floor, girder, joist, rafter(hut)
31	Fagaceae	*Lithocarpus* sp	Beling ulet	Tree	Wood	L.Piara, L.lati, awa umo	Pole, floor, joist, door, window
32	Fagaceae	*Castanopsis* sp	Serangan	Tree	Wood	T. alas, L. Lati, Awa umo	Pole, floor, joist,door,window
33	Fagaceae	*Castanopsis* sp	Pidawi	Tree	Wood	T. Alas, L. Lati,	Pole, joist, door, window, girder
34	Fagaceae	*Lithocarpus conocarpus*	Salet pade	Tree	Wood	T.Alas, L. Piara	Pole, joist, girder
35	Fagaceae	*Lithocarpus* sp	Salet lengurung	Tree	Wood	T. Alas, awa umo	Pole, joist, girder
36	Hypericaceae	*Cratoxylum* sp	Balibakan	Tree	Wood	Tana alas, Awa umo	Roof
37	Hypericaceae	*Cratoxylum sumatranum*	Lingo	Tree	Wood	Tana alas, Lati piara	Pole, girder, joist (hut)
38	Juglandaceae	*Engelhardtia* sp	Kayu barikau	Tree	Wood	Tana alas	Wall, floor,joist,rafter,door,window
39	Juglandaceae	*Engelhardtia* sp	Falang	Tree	Wood	Tana alas	Floor, girder, rafter, lath (hut)

No	Family	Name	Local name	habitat	Plant part	Source	Main uses
40	Lauraceae	*Litsea* sp	Laget labo	Tree	Wood	Awa umo, Lati Piara, ekang	Poles,floor,girder,rafter(hut)
41	Lauraceae	*Litsea odorifera*	Meranpung	Tree	Wood	Tana alas, Tana Ekang	Wall, floor,girder,rafter,door
42	Lauracea	*Litsea garciae*	Tafal	Tree	Wood	Tana alas, Tana ekang	Floor,girder,joist,rafter(hut)
43	Melliaceae		Kayu taraq	Tree	Wood	Tana alas,	Wall, floor,girder,joist,door
44	Myrtaceae	*Tristaniopsis* sp	Belibakan	Tree	Wood	Tana alas, awa umo	Pole, girder, joist
45	myrtaceae	*Eugenia polyantha*	Kayu ubar	Tree	Wood	Awa umo, tana ekang	Floor, girder, joist, rafter(hut)
46	Poaceae	*Dendrocalamus* sp	Bulo"batung	Bamboo	Stem	Tana Alas, Awa umo	Floor, wall(hut), chicken coop
47	Paoceae	*Schizostachyum blumei*	Bulo'talang	Bamboo	stem	Awa umo, lati piara,	Roof, wall, chicken coop
48	Podocarpaceae	*Podocarpus imbricatus*	Pirur	Tree	Wood	Awa umo, tana alas	Wall, floor,girder,door,window
49	Podocarpaceae	*Podocarpus nerifolius*	Kayu buluk	Tree	Wood	Tana alas, T. Ekang	Wall, floor, joist, window, door
50	Sapotaceae	*Palaqium* sp	Nato	Tree	Wood	Tana alas, T. ekang	Wall, floor, joist, window, door
51	Sapotaceae	*Palaqium* sp	Tekalik	Tree	Wood	Tana alas, awa umo	Wall, girder, joist, window,door
52	Sterculiaceae	*Pterospermum diversifollium*	Kayu bayur	Tree	Wood	Tana alas, awa umo	Wall, girder, joist, window, lath
53	Symplocaceae	*Symplocos* sp	Sei abuh	Tree	Wood	Tana alas, awa umo, L.Piara	Pole, wall, girder, window
54	Theaceae	*Schima walichii*	sebuang	Tree	Wood	Tana alas, awa umo,	Pole,wall,girder,door,window
55	Ulmaceae	*Alphitonia excelsa*	Berenung	Tree	Wood	Tana alas, tana lati	Floor,pole,joist
56	Ulmaceae	Trema orientalis	Bintanung	Tree	Wood	Tana alas, awa umo	Floor, pole, joist (hut)
57	Ulmaceae	*Commersonia bartramia*	Linayaq	Tree	Wood	Awa Umo, Lati Piara	Floor, girder, rafter, lath(hut)

Tana alas=primary forest, Awa umo=old secondary forest, Tana lou lati=fruit gardens (old), Tana lati=shifting cultivation areas, Tana eking=border village area, Lati Piara=young fallow

Appendix 5.2 List of plants used for firewood by the people in Rantau Layung and Pinang Jatus

No	Family	Species	Vernacular name	Plant habit	habitat
01	Anacardiaceae	Camnosperma *sp*		Tree	AU, LP, LL,
02	Annonaceae	*Cyathocalyx* sp	pelintan	Tree	AU,LP
03	Asteraceae	*Veronia arborea*	Biubuh	Tree	AU, LP
04	Casuarinaceae	Gymnostema sumatrana	Kayu aru	Tree	AU
05	Clusiaceae	*Garciniia v cowa*	Kaji	Tree	AU
06	Clusiaceae	*Garcinia lateriflora*	Kitung	Tree	AU,TA
07	Elaeocarpaceae	*Elaeocarpus sp*	Kayu serudang	Tree	TA
08	Euphorbiaceae	Macaranga triloba	Binsang	Tree	AU
09	Euphorbiaceae	*Macaranga hulleti*	Binuang	Tree	AU,LT,LL
10	Euphorbiaceae	Glochidion rubrum	Kubaraba	Tree	AU, TA
11	Euphorbiaceae	*Macaranga* sp	Minir	Tree	AU, LP,LL
12	Fagaceae	*Lithoocarpus* sp	Beling uled	Tree	TA
13	Fagaceae	*Castonopsis* sp.	Kayu berangan	Tree	AU
14	Fagaceae	*Castonopsis* sp.	Pidawi	Tree	AU
15	Fagaceae	*Lithocarpus*	Saled pade	Tree	AU
16	Fagaceae	*Lithocarpus conocarpus*	Saled pade	Tree	AU
17	hypericaceae	*Cratoxylon sumatranum*	lingo	Tree	AU
18	Juglandaceae	*Engelhardia* sp.	Palang	Tree	AU
19	Lauraceae	*Litsea* sp.	Laget labo	Tree	AU
20	loganiceae	*Fagrae racemnosa*	Girang	shrub	AU, LP, LL
21	Meliaceae	*Melia sp.*	Ulat	Tree	TA
22	Moraceae	*Ficus fistulosa*	Kayu uk	Tree	AU, LP
23	Myrtaceae	*Tristaniopsis whiteana*	Laban	Tree	AU,LP,LL
24	Myrtaceae	*Eugenia polyantha*	Kayu ubar	Tree	TA
25	Myrtaceae	Eugenia bankensis	Ubersinaraq	Tree	AU, LP
26	Rubiaceae	*Nauclea macrophylla*	Atap ubuh	Tree	AU, LP
27	Rubiaceae	*Pavetta* sp	Kayu baar	Tree	AU
28	Rubiaceae	*Canthium*	Kayu idab	Tree	AU,TA
29	Saurauiaceae	*Saurania* sp.	Anor	Tree	AU, LP
30	Symplocaceae	*Symplocos* sp.	Kayu moovo	Tree	AU, LL, LP
31	Ulmaceae	*Alphitonia exelsa*	Berenong	Tree	AU, LP
32	Ulmaceae	*Trema orientalis*	Bintanung	Tree	AU
33	Verbenaceae	*Geunsia pentandra*	Kayu tebiar	Tree	AU

TA=Tana alas=primary forest; AU=Awa Umo=old secondary forest; LL=Lou Lati=Old fallow area; LP=Lati Piara=young fallow area

Appendix 5.3.List of plants used for food in indigenous people of Rantau Layung

No	Family	Scientific name	Local name	Habitat	Part used	Uses
01	Anacardiaceae	Mangifera odorata	Kuini	LL,AU	Fruit	Edible fruit
02	Anacardiaceae	Mangifera indica	Palam	LL	Fruit	Edible fruit
03	Annonaceae	*Annona muricata*	Bua lapun	AU	Fruit	Edible fruit
04	Araceae	*Acorus calamus*	Kariboro	AU	Rhizome	Medicine
05	Araceae	*Colocasia* sp.	Uwa item	AU	Tuber	Vegetable
06	Araceae	Colocasia esculentum	Uwa	AU	Tuber	Vegetable
07	Araceae	*Colocasia* sp.	Uwa	AU	Tuber	Vegetable
08	Arecaceae	Cocos nucifera		AU	Fruit	Edible fruit
09	Arecaceae	Salacca zalacca	Salak	AU	Fruit	Edible fruit
10	Arecaceae	*Arenga bervipes*	Derama	AU	Cabbage	Vegetable
11	Arecaceae	Eugessonia utilitis	Kinangan	TA	Cabbage	Vegetable
12	Arecaceae	*Omcosperma horridum*	Nibung	TA	Cabbage	Vegetable
13	Arecaceae	*Daemonorops* sp.	Uwe korat	TA	Cabbage	Vegetable
14	Arecaceae	*Daemonorops* sp.	Uwe luduh	TA	Cabbage	Vegetable
15	Arecaceae	*Daemonorops* sp.	Uwe petari	TA	Cabbage	Vegetable
16	Athyriaceae	*Diplazium esculentum*	Pau aba	TA	Young fronds	Vegetable
17	Basellaceae	*Basella alba*	Dinudur	AU	Leaves	Vegetable
18	Blechnaceae	*Stenochlaena palustris*	Siaq	AU,TA	Young fronds	Vegetable
19	Bombacaceae	*Durio zibethinus*	Durian	AU,TA	Fruit	Edible fruit
20	bombacaceae	*Durio* sp.	Kayu belalai	TA	Fruit	Edible fruit
21	Brassicaceae	*Brassica chinensis*	Sawi	LP	Leaves	Vegetable
22	Brassicaceae	*Brassica chinensis*	Sesawi	LP	Leaves	Vegetable

23	Bromeliaceae	Ananas comosus	Bua kaber	LP	Fruit	Edible fruit
24	Clusiaceae	*Garcinia cowa*	Kazi	AU	Fruit	Edible fruit, flavouring agent
25	Clusiaceae	*Garcinia* sp	Kitung	AU	Fruit	Edible fruit
26	Convolvulaceae	*Ipomoea batatas*	Ubi lar	LL	Tuber	Vegetable, snack
27	Cucurbitaceae	*Luffa acutangula*	Bua pula	AU	Fruit	Vegetable
28	Cucurbitaceae	*Momordica charantia*	Pare	LP	Fruit	Vegetable
29	Cucurbitaceae	*Luffa acutangula*	Bua sepula	LL	Fruit	Vegetable
30	Cucurbitaceae	*Cucurbita* sp.	Tasak buda	AU	Fruit	Vegetable
31	Cucurbitaceae	*Cucurbita moschata*	Tacak sia	AU	Fruit	Vegetable
32	Euphorbiaceae	*Aleurites moluccana*	Bengkirik	AU	Fruit	Food spice
33	Euphorbiaceae	*Sauropus androgynus*	Kayu manis	LP	Young leaves	Vegetable
34	Euphorbiaceae	*Manihot esculenta*	Ubi kayu	LL,LP	Tuber, young leaves	vegetable
35	Leguminosae	*Vigna unguiculata*	Bavuritak	LL,LP	Fruit	Vegetable
36	Leguminosae	*Parkia speciosa*	Petai	AU,LL,LP	Fruit	Vegetable
37	Leguminosae	*Castonopsis sp*	Berangan	LL,LP	Nut	Edible nut
38	Lamiaceae	Ocinum sanctum	Bawing	AU,LL	Leaves	Vegetable
39	Lauraceae	*Litsea garciae*	Bua talal	LP,LL	Fruit	Edible fruit
40	Lauraceae	*Litsea cubeba*	Tenem	LP, LL	Fruit	Food spice
41	Leguminosae		Kacang tanduk	LP	Fruit	Vegetable
42	Liliaceae	*Alium* sp.	Bawang	LP	Leaves and tuber	Food spice
43	Liliaceae	*Allium tuberosum*	Kusai	LP	Leaves	Food spice
44	Malvaceae	*Abelmoschus manihot*	Riyap bata	LP	Leaves	Vegetable
45	Meliaceae	*Lansium domesticum*	Bua belunuk	LP	Fruit	Edible fruit

46	Moraceae	Artocarpus integer	Cempedak	AU, LP, LP	Fruit	Edible fruit
47	Moraceae	Artocarpus rigidus	Bua kiran	LL	Fruit	Edible fruit
48	Moraceae	*Artocarpus heterophyllus*	nangka	AU,LP	Fruit	Edible fruit
49	Musaceae	*Musa paradisiaca*	Pisang	LP,LL	fruit	Edible fruit
50	Musaceae	*Musa* sp.	Sibak	Straat, LL	Cabbage	Vegetable
51	Musaceae	*Eugenia jambos*	Keleweh	Straat, LL	Fruit	Edible fruit
52	Myrtaceae	*Psidium guajava*	Bua libuh	AU, LP	Fruit	Edible fruit
53	Musaceae	*Musa sp.*	Yawan	LL,LP	cabbage	Vegetable
54	Myrtaceae	*Eugenia polyantha*	Kayu ubar	TA	Fruit	Edible fruit
55	Oxalidaceae	*Averhoea carambola*	Belimbing	LP,AW,LL	Fruit	Edible fruit
56	Pandanaceae	*Pandanus odoratissimus*	Pandan harum	AU, Straat	Leaves	Flavouring agent
57	Poaceae	*Cymbopogon nardus*	Bawing	LL, LP	Stem	Food spice
58	Poaceae	*Zea mays*	Jagung	LL,LP	Fruit	Vegetable
59	Poaceae	*Coix lacryma-jobi*	Dariak rokob	LL,LP	Seed	Food
60	Poaceae	*Oryza sativa*	Padi	LP	Seed	Staple food
61	Poaceae	*Dendrocalamus* sp.	Bulu	AU,TA	Shoot	Vegetable
62	Poaceae	*Saccarum officinarum*	Tepu	LL,LP	Stem	Snack/sweeter
63	Rubiaceae	*Coffea arabica*	Kopi	LP	Fruit	Drinks
64	Rutaceae	*Citrus hystric*	Jeruk purut	LP,Straat	Fruit	Food spice
65	Rutaceae	*Citrus reticulata*	Jeruk	Straat ,LP	Fruit	Edible fruit
66	Rutaceae	*Citrus maxima*	Jeruk besar	Straat, LP	Fruit	Edible fruit
67	Sapindaceae	*Nephelium ramboutan*	Meritem	Straat, LL,LP	Fruit	Edible fruit
68	Sapindaceae	*Dimocarpus longan*	Bua mavu	LL,LP	Fruit	Edible nut

69	Sapindaceae	*Nephellium lappacerum*	Rambutan	LP,Straat,LP	Fruit	Edible fruit
70	Sapindaceae	*Nephelium cuspidatum*	Sia	AU,LP	Fruit	Edible fruit
71	Sapotaceae	*Achras zapota*	Sawo	AU	Fruit	Edible fruit
72	Solanaceae	Solanum melongena	Bitarung	AU,LP	Fruit	Vegetable
73	Solanaceae	*Capsicum frutescens*	Ladeh abai	AU,Straat	Fruit	Food spice
74	Solanaceae	*Capsicum annuum*	Ladeh kalang	Straat, LP	Fruit	Food spice
75	Solanaceae	*Solanum lycorpersicum*	temate	LP.LL	Fruit	vegetable
76	solanaceae	*Solanum macrocarpa*	Bitarong buluh	AU, LL	Fruit	Vegetable
77	Solanaceae	*Solanum torvum*	Ulem	AU, LL,LP	Fruit	Vegetable
78	Urticaceae	*Hyrtanandra hirta*	Riap	LL,LP	Young shoot	Vegetable
79	Zingiberaceae	*Kaempfera galanga*	Kencur	LL,LP	Tuber	Food spice
80	Zingiberacea	*Zingiber officinale*	Liyeh	LL,LP	Tuber	Spice
81	Zingiberaceae	*Etlingera* sp.	Bako	LL,LP	Fruit	Edible fruit
82	Zingiberaceae	*Etlingera* sp.	Bako cat	LL,LP	Young shoot,flower,fruit	Vegetable, edible fruit
83	Zingiberaceae	*Etlingera fimbriobracteata*	Bako layun	LL,LP	Young shoot,fruit	Vegetable, edible fruit
84	Zingiberaceae	*Etlingera punichea*	Tubu	LL,LP	Young shoot, flower	Vegetable, edible fruit
85	Zingiberaceae	*Plagiostachys* sp.	Bako labo	LL,LP	Fruit	Edible fruit

Appendix 5.4. List of plants used as medicines in Rantau Layung Paser indigenous people

No.	Family	Scientific name	Local name	Plant habit	Habitat	Part of plant used	Uses
01	Acanthaceae	Justicia gendarrusa	Petunap rambut	shrub	AU, LL	leaves	Hair tonic
02	Agavaceae	*Dracaena* sp	Tukul langit	Herb	LL,LP	Water from the bud	Abscesses inside the ear
03	Asteraceae	*Adenostemme lavenia*	Uda banringan	Herb	LL,LP	Leaves	Tonsil
04	Annonaceae	*Goniothalamus* sp	Kayu obat	Tree	TA,AU	stem	Healing of wound
05	Annonaceae	*Desmos chnensis*	War arip	Climber	AU	Leaves	Gastricis problem
06	Apocynaceae	*Alstonia angustiloba*	Kayu angah	Tree	TA	Roots, sap	Roots;malaria,sap;burnt
07	aquifoliaceae	*Ilex* sp	Buvuk	Tree	AU	Young leaves	Asthmathic
08	Araceae	*Acorus calamus*	Kariboro	Herb	LL	Rhizome	Cancer
09	Araliaceae	*Schefflera petiolosa*	Wartukang	Climber	AU	Young leaves	Ulcer the mouth
10	Arecaceae	*Daemonorops*	Uwe keraru	Rattan	TA,LL	Young shoots	Headache
11	Asteraceae	*Blumea balsamifera*	Impung	Shrub	TA, AU	Young leaves	Wound, cough, body odour
12	Asteraceae	*Vernonia arrborea*	Kayu biubuh	Tree	TA,AU	Inner bark	Gastricis problem
13	Asteraceae	*Elephanthopus scaber*	Sigok ada	Schrub	AU,Straat	Leaves	Malaria, cough
14	Blechnaceae	*Blechum orientale*	Belikuku	Fern	AU,LL	Young fronds	Abscessces and boils
15	Dillinaceae	*Tetracera arborescens*	War udu	Climber	AU,LL	Water from the stem	Intestinal inflammation
16	Eleaocarpaceae	*Eleaocarpus* sp.	Tuba	Tree	TA	Bark	Skin diseases
17	Ericaceae	*Rhododendron* sp.	Kayu legugus	shrub	TA	Leaves	Irreguler menstrual periods

18	Euphorbiaceae	*Mallotus paniculatus*	Liked	Shrub	AU,LP	Inner bark	Gastrici problem
19	Euphorbiaceae	*Jatropha curcas*	Jarak	Shrub	LL,LP	Sap	Stomach ache
20	Joinvilleaceae	*Joinvilleae* sp.	Abang garung	Herb	TA	Shoot	Abscesses and boils
21	Lamiaceae	*Coleus blumei*	Radak	Herb	LL	Leaves	Bady pain
22	Lamiaceae	*Ocinum sanctum*	Bawing	Herb	TA,AU	Leaves	Flatulence
23	Lauraceae	*Litsea cubeba*	Tanem	Tree	TA, AU	Root	Gastricis problem
24	Lauraceae	*Cinnamomun* sp.	Kayu tamabar	Tree	LL, LP,AU	Root, stem, leaves	Stomach ache, fever
25	Leguminosae	*Spatholobus* sp.	Warsia	Climber	LP,LL,	Sap	Cancer
26	Reguminosae	*Hymenae* sp.	Lamut	Fern	LL,LP,	Fronds	Cough
27	Liliaceae	*Curculijo* sp	Lampak	Herb	TA,AU	Rhizome	Healing of wound
28	Loganiaceae	*Fagrae racemosa*	Girang	Shrub	AU,TA	Root, fruit,leaves	Root;Tooth ache, leaves;headache
29	Melastomataceae	*Sonerila*	Ubat balita	Herb	AU,TA	Leaves	Treating ringworms
30	Melastomataceae	*Disochaeta* sp.	Kayu uri	Tree	TA	Leaves	Gastricis problem
31	Menispermacae	*Arcangelicia flava*	War bira	Climber	AU,LP	Vine, root	Eye lotion
32	Moraceae	Ficus pubinervis	Nawer	Tree	LP,TA,AU	Sap	Burnt skin
33	Myrsinaceae	*Embelia oblongata*	Warilang oko	Climber	AU	Water from the stem	Sore eyes
34	Myrtaceae	*Psidium guajava*	Jambu	Tree	Straat, LP, LL	Leaves	Diarrhea
35	Nepenthaceae	*Nepenthes* sp.	War telungan bacuk	Climber	TA, AU	Water from the leaves	Urinating problem, ear problem
36	Piperaceae	*Piper* sp	Obat uri	Climber	TA	Leaves	Gastricis problem
37	Piperaceae	*Piper* sp	Uyong bong	Climber	TA	Leaves	Stomach ulcer
38	Poaceae	*Dinochloa scandens*	Bulo ican	Bamboo	TA	Water from the culm	Eye lotion

39	Poaceae	*Paspalum conjugatum*	Udu karabau	Herb	TA	Leaves	Sprains
40	Poaceae	*Laphaterum gracile*	Uduoko	Herb	LL	Root	Diabetes
41	Poaceae	*Sachharum officinarum*	Tepuh sia	Herb	LL	Sap	Tuberculosis
42	Rubiaceae	*Psychotria* sp.	petunat	Shrub	LP	Leaves	Hair shampoo
43	Rubiaceae	*Hoya* sp.	Waperata	Climber	TA	Sap	Skin diseases
44	Rubiaceae	*Borreria* sp.	Udu layat	Shrub	TA, AU	Tem, leaves	Syphilis, gonorrhea
45	Sapindaceae	*Nephellium rambutan-ake*	Meritem	Tree	LL,Straat	bark	Skin diseases
46	Schisandraceae	*Kadsura scandens*	War putut urat	Climber	AU	Vine, leaves	Ancle sprain
47	Simaroubaceae	*Euricoma langifolia*	Pasak bumi	Shrub	TA, TE	Root	Malaria, neck diseases
48	Solanaceae	*Solanum torvum*	Ulem	Shrub	TA, AU	Root	Gastricis problem
49	Urticaceae	*Leucosyke capitella*	Kayu pikukuh	Tree	AU	Young leaves	Stomach ache, hair shampoo,
50	Verbenaceae	*Clerodendron paniculata*	Kayu telaka	Shrub	LL,LP	Leaves, flower	Tuberculosis
51	winteracea	*Drymis piperita*	Obat met wang	Herb	TA	Bark	Body pain
52	Zingiberaceae	*Boesenbergia stenophylla*	Kariburo	Herb	TA,TE	Root	Intestinal warms
53	Zingiberaceae	*Etlingera* sp.	Bako tekeruku	Herb	AU,LP	Root	Stomach ache

Appendix 5.5. List of plants used for cultural and ceremonies purposes including magic by the indigenous people of Paser in Rantau Layung

No	Family	Scientific name	Local name	Plant habit	Habitat	Part used	Purposes
01	Annonaceae	Friesodielsa argentia	akos	Climber	Au, LL	Stem, leaves	To eradicate magic
02	Annonaceae	*Gonithalamus* sp.	Tutu dada	Tree	AU	Bark, stem	To evict ghost
03	Apocynaceae	*Alyxia* sp.	Belintang	Tree	TA, TE	Stem	To attract the woman
04	Euphorbiaceae	*Acalypa* sp.	Paulun	Tree	AU	Stem	Believed as anti illness
05	Gesneriaceae	*Aesschynanthus* sp	War palakad	Climber	TE	Flower	To attract a woman
06	Hemionitidaceae	*coniogramma*	karaab	fern	LL,LP	fronds	Anti magic
07	Liliaceae	*Dianella ensifolia*	Pakasul	Herb	AU, LP	Leaves	To ease in fiching-catching
08	Melastomataceae	*Memcylon amplexicaule*	Kayu petulu	Tree	TA	Stem	Bring good luck
09	Oleandraceae	*Oleandra pistilaris*	Gerumung	Fern	TA	stem	Bring good luck
10	Piperaceae	*Piper* sp.	War pataga	Climber	LL,AU	Leaves	To enhance woman beauty
11	Podocarpaceae	*Phylocladus* sp.	Kayu pelayo	Tree	LL,LP	Stem	To gain sympathy
12	Rubiaceae		War Lapad Urab	Climber	LL,AU	Vine	Protection from bad magic
13	Smilaceae	*Smilax odoratissima*	War Kaluvan	Climber	AU,TA	Leaves	To forget the passed family member
14	Smilaceae	*Smilax*	War katab serai	Climber	LL,	Vine	To enable a person to chew glass without wounded himself
15	Theaceae		Kayu lapad	Tree	TA,TE	Stem	To prevent house from magic
16	Zingiberaceae	*Boesenbergia stenophylla*	Kariburo sia’	herb	AU	Roots	To evict ghost
17			Udu Lapad	Herb	AU	Leaves	Anti woman magic
18			Pataga	Herb	AU,LP	Leaves	To enhance woman’s beauty

Appendix 5.6. List of plants used for various tools by the indigenous people of Paser in Rantau Layung

No	Family	Scientific name	Local name	Uses
01	Annonaceae	*Cyathocalyx* sp.	Pelinitan	Animal trap
02	Arecaceae	*Caryota mitis*	Riman labo	Kine case
03	Arecaceae	*Daemonorops sabut*	Uwe ingan	Fish trap, back pack, paddy carrier, winnower, soop,baby carrier
04	Arecaceae	*Daemonorops* sp	Uwe petari	Backpack
05	Arecaceae	*Calamus* sp.	Uwe petet	Paddy carrier
06	Arecaceae	*Calamus* sp.	Uwe puih	Paddy carrier, sieve, scoop, waist carrier, backpack, fish trap
07	Arecaceae	*Korthalsia* sp.	Uwe sia'	Paddy carrier, waist carrier, backpack,
08	Arecaceae	*Licuala valida*	Liad	Rain cover
09	Arecaceae	*Korthalsia* sp.	Uwe ser	Food tweezer
10	Arecaceae	Oncosperma horridum	Nibung	Ladle
11	Causarinaceae	*Gymnostema sumatrana*	Kayu anu	Hammer holder, oar, axe holder
12	Clusiaceae	*Garcinia lateriflora*	Ketung	Blowpipe
13	Cyperaceae	*Macaheria rubiginosa*	Karubat	Floor mat
14	Cyperaceae	*Fimbrystylis globusta*	Siar	Floor mat
15	Dileniaceae	*Tetracera arboresecens*	War ubu	Sandpaper
16	Ericaceae	*Vaccinium* sp.	Kayu one	Sword holder (mandau)
17	Euphorbiaceae	*Macaranga triloba*	Saled	Bullock cart, oar, yoke
18	Fagaceae	*Castonopsis* sp.	Pidawi	Bullock cart, hoe holder, yoke,
19	Fagaceae	*Lithocarpus* sp.	Saled	Bullock cart, oar, yoke
20	Hyperiaceae	*Cratoxylum* sp.	balebakan	Dart bag holder, parang case, ladle, yoke
21	Hypoxidaceae	*Curculijo spp.*	Tamar	Rope
22	Lauraceae	*Litsea odorifera*	Memafung	Boat, bullock cart, mortar, oar
23	Lauraceae	*Litsea odorifera*	Memafung	Mortar
24	leguminosae	*Phanera sembifida*	War ayep	Fish scoop
25	Leguminosae	*Phanera sembifida*	War ayep	Fish net

26	Leguminosae	*Entada* sp.	War pugah	Parang holder
27	Leguminosae	*Spatholobus* sp.	War ale	Parang holder
28	Leguminosae	*Fordie* sp.	War bakar	Fish trap
29	Linaceae	*Roucheria griffithiana*	War bakar	Fish trap
30	Melastomaraceae	*Memecylon* sp.	Sinara'	Pestle
31	Meliaceae		Kayu tara'	Boat
32	Moraceae	*Artocarpus elasticus*	Talin	Traditional shirt
33	Moraceae	*Artocarpus kemando*	Puduh	Paddy store
34	Myrtaceae	*Eugenia bankensis*	Uber sinara'	Parang holder, spear holder
35	Palmae	*Calamus* sp.	Uwe puceh	Binding device
36	Palmae	*Eugenia utilis*	Kinangan	Blowpipe dart, fish trap
37	Palmae	*Arenga brevipes*	Deramah	Dart
38	Palmae	*Arenga brevipis*	Deramah	Broom
39	Poaceae	*Dendrocalamus* sp.	Bulo batung	Drum
40	Poaceae	*Schyzostachyum brachycladum*	Bulu talang	Bamboo tube, dart bag, backpack, fish trap
41	Poaceae	*Bambusa vulgaris*	Bulo yiik	Tool for plaiting mat
42	Poaceae	*Schyzostachyum blumei*	Bulu puran	Fish trap, sieve, scoop, waist carrier, winnower, backpack
43	Poaceae	*Schyzostachyum* sp.	Bulu sebiling	Fishing rod, flute
44	Podocarpaceae	*Phylocladus* sp.	Pelayo	Knife holder
45	Podocarpaceae	*Podocarpus imbricatus*	Pirur	Furniture, ladle
46	Podocarpaceae	*Agathis borneensis*	Kayu tumuh	Furniture
47	Rhamnaceae	*Alphitonia exelcsa*	Berenung	Axe holder, parang case, scythe holder
48	Rubiaceae	*Canthium sp.*	Idib	Stick for plantingpaddy (nguan)
49	Sapotaceae	*Palaqium* sp.	Darian ada'	Boat
50	Sapotaceae	*Palaqium* sp.	Nato'	Oar, yoke, pestle, spear holder
51	Sterculiaceae	*Pterospermum diversifolium*	Bayur	Boat, bullock cart
52	Ulmaceae	*Trema orientalis*	Bitanung	Paddy store (kelimang)
53	Zingiberaceae	*Etlingera fimbriobracteata*	Bako layun	Floor mat (lugam)

Appendix 6.1. Estimated volume of extraction (production,consumption, market) of village activities in Rantau Layung in 2005

H. holds No.	Activities and volume of production													
	Farm			Mi ning (grm)	Tim ber (m3)	Non-timber forest products (NTFPs)								
	Rice (kg)	Crops (kg)	Live stock (kg)			Fuel wood (kg)	Fish (kg)	Rattan (kg)	Honey (ltr)	Craft (pcs)	Hun Ting (kg)	P. Wine (ltr)	Fruit/ food (kg)	Others (kg)
1	-			-	-	1,588	46	1,440	-	-	-	-	-	64
2	280	112	9	-	-	1,440	-	-	-	-	-	-	-	88
3	112	44.8	4	-	21	900	44	-		-	-	-	287	153
4	168	67	6	-	32	1,336	-	677	-	-	-	-	-	175
5	560	224	19	2.55	-	1,332	-	1778	12.5	-	-	-	-	62
6	1,120	448	375	-	-	1,348	38	5822	-	-	182	-	300	61
7	542	34	-	-	12	1,400	45	-	-	-	-	-	-	107
8	-	-	-	-	-	1,700	-	-	-	-	-	-	782	94
9	432	-	12	4.08	-	1,728	-	-	-	-	-	-	-	70
10	320	80	-	-	-	1,320	35	-	-	-	-	-	214	120
11	448	179	15	-	38	1,700	46	-	-	-	-	-	-	97
12	112	45	4	-	-	1,320	-	-	13.20	-	-	-	254	95
13	80	-	-	-	-	1,380	38	333	-	-	-	-	-	48
14	560	224	18	-	16	1,540	-	4133	-	-	146	-	-	80
15	480	-	-	-	-	1,400	-	2233	14.37	-	-	-	-	87
16	-	-	75	-	34	1,488	48	3618	13	-	187	-	115	40
17	1,120	-	140	-	-	1,584	-	1880	14.50	-	-	-	-	70
18	560	168	-	4.08	-	1,620	-	1944	-	-	-	600	-	80
19	140	20	-	-	-	1,716	43	-	-	-	-	-	254	107
20	80	-	-	-	-	1,010	-	-	-	8	-	-	-	122
21	720	80	-	-	-	1,336	-	1977	-	-	-	-	-	93

22	168	67	-	-	-	908	-	-	-	9	-	-	305	123
23	960	-	150	-	-	1,400	-	4477	13	-	-	-	362	128
24	720	56	112	-	16	1,472	-	4700	-	-	-	-	-	178
25	640	64	-	2.55	-	1,276	36	1640	-	-	-	-	315	143
26	588	67	-	-	-	1,440	-		-	-	-	-	-	116
27	600	280	-	-	-	1,492	-	-	-	7	-	-	-	80
28	-	-	-	-	-	1,408	-	1511	-	-	-	-	-	142
29	280	168	-	-	-	1,360	-	1644	-	-	-	-	200	131
30	240	-	37	-	-	1,280	-	-	15	-	-	-	115	116
31	-	-	-	8.16	14	1,680	-	-	-	-	160	-	948	104
32	280	-	420	-	-	1,276	-	-	17	-	-	-	-	65
33	290	15	22	-	-	1,492	38	1344	14.5	-	-	-	-	88
34	560	224	17	-	-	808	-	1440	-	-	-	-	105	80
35	480	112	56	-	-	1,080	-	-	12.50	-	-	-	345	43
36	640	-	37	-	-	1,260	-	2333	14	-	-	-	-	23
37	560	224	20	5.81	-	1,440	34	1522	13	7	-	700	-	63
38	280	112	10	-	-	1,396	-	-	12	-	-	-	-	173
39	300	-	230	-	12	1,456	-	-	-	-	-	-	70	75
40	560	280	-	-	-	1,300	37	-	9	-	-	-	-	85
41	228	-	-	-	-	1,104	50	571	16	-	275	-	182	110
42	-	-	-	-	-	1,320	-	-	16	-	-	-	-	182
43	308	-	30	3.46	-	796	-	-	-	-	-	-	-	107
44	192	34	35	-	28	936	52	-	-	-	-	-	185	90
45	1,160	-	110	-	-	1332	-	2922	13	-	-	-	-	67
Total	**18,388**	**3,429**	**1,965**	**30.59**	**218**	**60,888**	**623**	**50,044**	**233.22**	**31**	**950**	**1300**	**3,958**	**9,047**

Source of data : The summary of the questioners, interview, measurements and field/households observation in Rantau Layung in 2005.

Appendix 6.2. Estimated volume of extraction (production, consumption, market) in Pinang Jatus in 2005

H. Holds No.	Volume of production												
	Farm			Log-ging (m3)	Non-timber forest products (NTFPs)								
	Rice (kg)	Crops (kg)	Live stock (kg)		F. Wood (kg)	Fish (kg)	Rattan (kg)	Honey (liter)	Crafts (pcs)	Hun Ting (kg)	P. Wine (liter)	Fruit / foods (kg)	Other NTFPs (kg)
1	554	138	-	75.5	1,138	142	-	-	-	-	-	168	37
2	504	76	50	-	896	-	3,402	11	-	-	-	174	44
3	603	100	40	15.5	1,068	78	-	-	-	-	-	163	42
4	580	45	100	-	960	117	-	-	-	94.7	-	155	41
5	630	-	-	-	982	90	-	-	-	-	-	152	42
6	693	218	-	-	838	-	2,846	-	-	150	-	168	40
7	919	290	-	15.5	1,068	-	2,236	-	-	-	-	120	48
8	928	312	60	-	982	-	-	11	-	-	-	144	63
9	826	268	23	-	1,010	97	2,846	-	11	-	-	136	23
10	274	-	63	15.5	834	100	-	-	-	-	-	125	42
11	334	84		-	976	55	3,320	-	-	-	-	-	44
12	658	96	64	-	976	-	-	11	-	-	-	157	42
13	554	52	27	27	1,126	-	1,694	-	12	-	-	168	38
14	622	83	52		1,068	-	-	8	-	-	-	211	45
15	596	69	40	31	780	144	-	-	-	-	-	144	44
16	512	34	10	-	838	112	-	-	-	-	-	141	37
17	523	38	15	-	1,010	90	-	-	-	474	-	-	27
18	632	88	56	-	1,126	-	1,734	-	-	-	-	120	42

19	982	50	08	15.5	1,068	-	1,422	-		-	-	125	80
20	773	45	204	-	896	-	-	5.6	11	-	203	-	68
21	334	-	83	27	982	-	-	5.6	-	-	234	-	41
22	297	-	75	31	1,068	-	1,558	-	-	-	-	-	36
23	512	34	18	-	896	-	-	5.6	14	-	-	217	39
24	350	16	80	-	1,010	-	2,642	-	-	-	-	-	27
25	575	60	34	15.5	1,134	-	1,896	-	13	-	-	-	42
26	648	92	68	15.5	780	-	2,982	-	-	467	-	-	25
27	710	19	82	-	1,184	-	-	5.6	14	-	-	174	39
28	306	-	76	-	722	-	3,658	-	-	-	-	-	40
29	238	-	59	-	780	-	3,658	-	-	-	-	-	44
30	516	96	164	-	1,358	100	-	13	-	-	-	-	64
31	439	-	89	31	1,010	-	-	7.7	-	-	-	114	60
32	575	61	34	-	780	-	-	12.6	-	-	-	146	47
33	198	84	70	-	606	-	-	12.6	-	-	-	103	47
34	125	53	44	-	490	-	-	12.6	-	-	-	168	44
35	145	62	52	-	606	92	-	-	-	-	-	195	42
36	255	109	91	15.5	750	-	3,524	-	-	-	-	119	69
37	925	68	123	-	1,010	-	3,252	-	-	-	-	87	73
38	819	208	156	-	548	107	-	-	8	-	-	125	69
39	219	93	78	-	1,010	-	2,168	-	-	-	-	228	42
40	548	192	160	15.4	606	-	2,778	-	-	-	-	103	43
41	570	90	-	-	1,010	-	2,372-	-	-	68	153	97	39
42	344	87	16	-	548	-	-	-	12	-	-	-	40

43	130	-	104	-	1,010	100	-	-	-	-	-	174	43
44	240	103	85	-	722	-	-	7.7	13	-	-	157	45
45	125	53	45	-	606	-	3,432	12	-	-	-	174	37
46	167	71	59	-	896	-	-	-	9	-	-	211	32
47	219	93	78	15.5	780	121	3,252	-	-	-	-	168	45
48	502	29	07	-	982	-	4,268	-	-	219	183	206	44
49	534	43	19	-	722	-	-	-	12	-	-	-	24
50	675	-	34	-	606	-	-	7.7	-	-	-	-	27
51	381	121	-	-	1,010	-	3,456	-	-	-	-	-	32
52	535	43	20	-	856	107	-	12	11	-	-	-	15
53	506	174	45	-	1,068	-	-	12	-	-	-	-	45
54	490	190	22	-	606	109	3,184	-	14	272	350	-	35
55	486	65	137	-	1,010	-	2,914	-	-	-	-	-	39
56	570	58	32	-	838	-	-	-	-	-	-	228	34
Tot	**27,905**	**2,467**	**2,995**	**373.33**	**50,000**	**1,883**	**73,200**	**173**	**156**	**1,723**	**1125**	**5,780**	**2,400**

Notes : This data is the aggregate of the questioners, interview, measurements and field/households observation in Pinang Jatus conducted in 2005.

Appendix 6.3. Estimated volume of extraction (production, consumption and market) in Muluy in 2006

H. Holds No.	Production volume												
	Farm				Non-timber forest products (NTFPs)								
	Rice (kg)	Crops (kg)	Live stock (kg)	Timber (m3)	Fuel wood (kg)	Fish (kg)	Rattan (kg)	Honey (liter)	Crafts (pcs)	Hun ting (kg)	Palm Wine (liter)	Food & Fruit (kg)	Others (kg)
1	207	-	-	-	1,344	-	-	12	-	51	648	36	39
2	423	174	145	-	1,680	18	6,176	-	12	60	-	40	51
3	390	-	134	32	1,440	16	6,176	-	2	61	-	51	44
4	427	263	-	-	672	20	6,176	12	9	44	-	25	34
5	420	259	-	32	768	-	6,176	12	-	67	-	65	48
6	272	-	-	-	680	21	6,176	12	4	54	-	43	53
7	330	-	-	93	1,260	40	6,176	12	-	-	-	77	55
8	388	160	133	93	920	29	6,176	12	-	75	-	38	43
9	494	-	145	-	1,440	-	-	-	-	78	-	19	66
10	423	174	175	-	1,440	-	-	12	-	55	-	38	52
11	512	210	-	31.5	1,920	20	5,072	12	-	63	-	45	58
12	3770	228	133	-	984	22	5,072	12	-	54	-	65	53
13	388	159	-	-	1,116	18	5,072	12	-	-	-	51	65
14	370	-	134	-	840	15	5,072	12	-	-	-	25	54
15	390	161	-	32.5	1,260	16	-	-	-	-	-	30	62
16	582	251	-	-	880	16	6,838	12	-	-	-	25	49
17	554	239	-	-	1,440	20	8,638	12	-	-	-	17	66

18	452	-	-	32.5	1,344	24	6,838	-	6	-	-	35	44
19	397	-	-	-	780	-	6,838	-	-	-	1,766	21	40
20	519	-	-	-	840	19	6,838	12	-	-	-	30	57
21	390	115	134	93	984	-	6,838	-	4	55	-	38	68
22	467	-	-	32.5	960	16	6,838	-	-	-	-	37	56
Total	**9,165**	**2,393**	**1,133**	**475**	**26,408**	**312**	**105,000**	**168**	**37**	**720**	**2,414**	**851**	**1,160**

Source of data : Summary of questioners and field/households observation in Muluy in 2005

Appendix 7a. An example of household capital inputs and outputs calculation

Village	: Rantau layung
Household number	: 15
Member interviewed	: Father, mother, and son
Name	: Dihim, Mrs Dihim and Ratuh
Age (year)	: 52 ; 18
Number of dependent	: 1 wife, 5 children
a. Capital holdings	: **Rp.23.570,000.-:**
	-1 motor bike, valued Rp. 14.5 million
	-1 canoe engine, valuie Rp. 2.5 million
	-1 chain saw, valued Rp. 4.2 million
	- Plastics cover (terpal) Rp. 0.250 million
	- 4 kaleng (60 kg) rice seeds Rp. 0.150 million
	- Knife, hoe, water tank Rp. 0.750 million
	- Oil consumption, Rp.0.720 million per-annum
	-others capital Rp. 0.5 million

b. Labour Inputs : 2,844 hours

- **Farm : 1,350 hours** ; Rice cultivation for 5 months or 130 days work, 1 day for 3 labors and 1 labor day is 3 hours, then total rice farm labor is 1,170 hours. For farm other crops is 1 hour per-day of 180 days work.
- **Store keeper: 800 hours**, is a work of one person for a whole year of 280 days work and 2.85 hours per-day.
- **Fuel wood : 234 hours** consists of 4.68 hours per-week for 50 weeks a year.
- **Rattan: 246 hours consists** of 6 harvesting times and one harvesting season consumed 41 hours or 7 days (a week)
- **Honey collection:74 hours**; 3 members of the family involved in 4 times of honey collection and 1 collection time is range from 4 to 7 hours.
- **Others: 140 hours**; This is the time used for collecting forest products such as medicine, making resins, collecting mushroom, etc.

c. Household output: Rp. 8.180.000.-

- In 2005 Dihim's family produced 60 kg of rice, 25 kg of fresh coffee, selling 15 kg beans, 25 kg cassava, 2 tandan (20 kg) of bananas, and small amount of chilli. the price of rice in the village is Rp. 3,500 per-kg, coffee price is Rp. 7,000 per-kg, and beans's price is Rp. 2,500 per-kg, and cassava price is Rp. 500 per-kg.

  The total amount of farm output value is Rp. 2,800,000.-
- The output value of store keeper is Rp. 4,680,000 per-year this is coming from the average added value of daily money receipt by keeper of Rp. 16,700 rupiah per-day.

- Fuelwood value is Rp.350,000,- This coming from the measurement of the price of fuelwood per-bundle is Rp. 1,500,- and the consumption of Mr.Dihim's fuelwood per year is 233 bundles per annum.
- Rattan value is Rp. 1,005,000,- is coming from the selling of 2,333 kg of green rattan in 2005. and the green rattan price is Rp. 450,-per-kg
- Honey collection value is Rp. 647,000,-. This is coming from the collection of 15.50 liters of wild honey and the price of honey at village is Rp. 45,000 per-liter.
- Others NTFPs value is Rp. 1.302,000,- this come from family collection of gaharu and the pasak bumi (eaglewood or *Aquilaria spp*. and *Eurycoma longifolia*).

Appendix 7b. Activities and labour time methods of calculation, an example for the village of Rantau Layung in 2005

Activities	Calendar	No. people involved*	HH. involved	Time budget (hour)
Farming	24 weeks a year and 24 hours per-weeks per-person	88 persons	45	46,000
NTFPs:				
• Fuelwood collection	50weeks a year and 4 hours per-weeks per-person	52 persons	45	10,400
• Rattan collection	16 weeks a year and 9hours per-week per-person	35 persons	22	5,040
• Honey collection	12 weeks a year and 4 hours per-week per-person	25 persons	18	1,200
• Fishing	50 weeks a year and 4 hours per- week per-person	15 persons	15	3,000
• Handicrafts	12 weeks a year and 12 hours per-week per-person	6 persons	4	864
• Fruit	12 weeks a year and 6 hours per-week per -person	22 persons	14	1,584
• Hunting	12 weeks a year and 5hours per-week per-person	7 person	5	428
• Palm wine	17weeks a year and 12hours per-week per-person	4 person	2	816
• Other NTFPs	50 weeks a year and 2 hours per-week per-person	56 person	50	11,200
Store keeper	50weeks a year and 32hours per-week per-person	5 person	5	8,000
Logging	8weeks a year and 48hours per-week per-person	11 person	4	4,224
Trading	20weeks a year and 18hours per-son	2 person	2	128
Gold mining	4weeks a year and 16hours per-week per-person	14 person	6	896
	T o t a l		45	93,780

*) One household usually involved in more than one activities, the same situation is applied for people often involved in more than one activities but number of people involved is not always representing the amount of time budget spent since some activities was conducted in seasonal, and not continuously like storekeeper. This figure is also indicates that people in Rantau Layung spent a lot of time for leisure this is shown by the allocation of time during the year that the busiest month is found in July to November for making paddy cultivation.

Appendix 8.1.a. Activities and household's labour time distribution in Rantau Layung in 2005

Hh No.	No. of depn.	Activities and labour time spent (hour)														
		Farm	Non-farm				NTFPs									Total hours
			Store	mi-ning	Log-ging	Tra-de	Fuel wood	Fish	Rat-tan	Ho-ney	Cra-fts	Hun-ting	Palm wine	Fruit	Others	
1	5	460	-	-	-	-	265	223	-	-	-	-	-	-	450	1,398
2	5	750	-	-	-	-	240	-	-	-	-	-	-	-	210	1,200
3	7	865	-	-	624	-	150	212	-		-	-	-	115	260	2,226
4	7	1,350	-	-	280	-	223	-	230	-	-	-	-	-	210	2,293
5	6	1,450	-	80	-	-	222	-	172	64	-	-	-	-	210	2,198
6	8	1,557	-	-	-	-	223	182	223	-	-	82	-	120	540	2,927
7	10	1,750	2400	-	360	-	245	210	-	-	-	-	-	-	310	5,275
8	4	550	-	-	-	-	284	-	225	-	-	-	-	113	230	1,402
9	4	810	-	122	-	-	286	-	-	-	-	-	-	-	210	1,428
10	4	670	-	-	-	-	220	168	-	-	-	-	-	86	240	1,384
11	5	1,200	-	-	480	-	284	224	-	-	-	-	-	-	220	2,408
12	3	550	-	-	-	-	220	-	-	68	-	-	-	102	140	1,080
13	4	750	-	-	-	-	220	186	180	-	-	-	-	-	380	1,716
14	5	1,450	-	-	340	-	256	-	220	-	-	66	-	-	240	2,572
15	6	1,350	800	-	-	-	234	-	246	74	-	-	-	-	140	2,844
16	4	550	-	-	460	-	248	196	268	66	-	84	-	46	380	2,298
17	3	1,650	-	-	-	-	264	-	214	74	-	-	-	-	240	1,442
18	4	1,350	-	120	-	-	270	-	238	-	-	-	246	-	140	2,364
19	5	948	-	-	-	-	286	206	-	-	-	-	-	102	460	2,002
20	3	650	-	-	-	-	168	-	-	-	210	-	-	-	400	1,428
21	6	1,250	-	-	-	-	223	-	265	-	-	-	-	-	400	2,138
22	4	880	-	-	-	-	185	-	-	-	228	-	-	122	200	1,612

23	5	1,580	-	-	-	-	234	-	145	68	-	-	-	145	210	2,382
24	3	1,550	-	-	480	-	224	-	243	-	-	-	-	-	150	2,647
25	4	850	-	80	-	-	213	174	284	-	-	-	-	126	210	1,937
26	3	850	-	-	-	-	237	-	-	-	-	-	-	-	300	1,387
27	6	1,340	-	-	-	-	249	-	-	-	186	-	-	-	260	2,035
28	4	475	-	-	-	-	234	-	287	-	-	-	-	-	220	1,216
29	7	1,350	2400	-	-	42	228	-	265	-	-	-	-	80	100	4,465
30	5	875	-	-	-	-	213	-	-	78	-	-	-	46	280	1,492
31	4	540	-	142	420	-	280	-	-	-	-	72	-	38	100	1,592
32	3	1,250	-	-	-	-	212	-	-	86	-	-	-	-	260	1,808
33	6	1,150	-	-	-	-	248	184	222	74	-	-	-	-	280	2,158
34	2	350	-	-	-	-	134	-	228	-	-	-	-	42	130	884
35	8	1,250	2400	-	-	86	180	-	-	68	-	-	-	126	250	4,360
36	6	1,200	-	-	-	-	234	-	248	74	-	-	-	-	380	2,136
37	5	1,350	-	220	-	-	264	166	295	66	176	-	560	-	100	3,197
38	3	750	-	-	-	-	233	-	-	62	-	-	-	-	370	1,415
39	4	890	-	-	360	-	243	-	-	-	-	-	-	28	200	1,721
40	3	1,240	-	-	-	-	217	178	-	46	-	-	-	-	230	1,911
41	5	660	-	-	-	-	184	243	246	82	-	124	-	73	220	1,832
42	4	870	-	-	-	-	222	-	-	82	-	-	-	-	240	1,414
43	4	820	-	132	-	-	133	-	-	-	-	-	-	-	180	1,265
44	3	620	-	-	420	-	156	248	-	-	-	-	-	74	290	1,808
45	4	1,450	-	-	-	-	222	-	224	68	-	-	-	-	310	2,274
Total	212	**46,000**	**8,000**	**896**	**4,224**	**128**	**10,400**	**3,000**	**5,040**	**1,200**	**864**	**428**	**816**	**1,584**	**11,200**	**93,780**
%		**49.05**	**8.53**	**0.96**	**4.50**	**0.13**	**11.09**	**3.20**	**5.37**	**1.27**	**0.92**	**0.45**	**0.87**	**1.68**	**11.94**	**100**
Average	4.7	**1022.2**	**2000**	**149.3**	**1056**	**64**	**231.1**	**200**	**229.1**	**66.7**	**216**	**85.6**	**408**	**113.1**	**248.9**	**2,084**

Source of data: The summary of questioners and field observation in Rantau Layung, 2005

Appendix 8.1.b. Activities and household's labor time distribution in Pinang Jatus in 2005

HH No.	No. of dept.	Activities and labour time spent (hour)														
		Farm	Non-farm				NTFPs									Total hours
			Store	Gov. officers	Log-ging	Trade	Fuel wood	Fish	Rattan	Honey	Crafts	Hun-Ting	Palm wine	Fruit	Others	
1	5	720	-	-	410	-	394	820	-	-	-	-	-	62	64	2,470
2	6	680	-	150	-	-	310	450	502	64	-	-	-	64	76	2,296
3	5	800	-	-	444	-	370	680	-	-	-	-	-	60	74	2,428
4	5	780	-	150	-	-	338	520	-	-	-	-	-	57	72	1,917
5	4	680	-	-	-	-	340	-	-	-	-	-	-	56	74	1,150
6	5	980	-	-	-	-	290	-	420	-	-	64	-	62	70	1,886
7	8	1300	-	-	444	-	370	-	330	-	-	-	-	44	84	2,572
8	7	1400	-	-	-	120	340	560	-	64	220	-	-	53	110	2,867
9	7	1200	-	560	-	-	350	580	420	-	-	102	-	50	40	3,302
10	4	340	-	560	410	-	289	320	-	-	-	-	-	46	72	2,037
11	4	450	-	560	-	-	338	-	490	-	-	-	-	-	76	1,914
12	3	880	-	-	-	-	310	-	-	64	240	-	-	58	74	1,626
13	3	680	-	-	410	130	390	-	250	-	-	-	-	62	66	1,988
14	5	820	-	-	-	-	370	832	-	44	-	-	-	78	71	2,215
15	5	760	-	-	-	-	270	650	-	-	-	-	-	53	78	1,811
16	4	600	-	-	-	-	290	520	-	-	-	-	-	52	64	1,526
17	5	620	-	-	-	-	350	-	-	-	-	320	-	-	48	1,338
18	6	840	480	-	-	-	390	-	256	-	-	-	-	44	72	2,082
19	8	1120	-	-	420	-	270	-	210	-		-	-	46	140	2,206

20	7	1100	-	-	410	-	410	-	-	32	220	-	186	-	120	2,478
21	6	450	-	-	410	-	250	-	-	32	-	-	214	-	72	1,428
22	2	400	-	-	-	-	270	-	230	-	-	-	-	-	64	964
23	5	600	-	-	-	160	470	-	-	32	280	-	-	80	68	1,690
24	6	480	-	-	-	-	390	-	390	-	-	-	-	-	48	1,308
25	6	720	-	-	-	-	270	-	280	-	260	-	-	-	74	1,604
26	5	860	-	-	412	-	270	-	440	74	-	316	-	-	44	2,416
27	6	980	-	-	-	-	410	-	-	44	280	-	-	64	68	1,846
28	5	410	462	-	-	120	250	-	540	72	-	-	-	-	70	1,924
29	4	320	-	-	-	-	270	-	540	72	-	-	-	-	78	1,280
30	4	880	-	-	-	-	470	580	-	72	-	-	-	-	86	2,088
31	3	460	-	-	412	-	350	-	-	-	-	-	-	42	112	1,376
32	3	720	-	-	-	-	270	-	--	-	-	-	-	54	106	1,150
33	2	380	-	-	-	-	210	-	-	-	-	-	-	38	82	710
34	1	240	-	150	-	-	170	-	--	-	-	-	-	62	76	698
35	2	280	-	150	-	-	210	914	-	-	-	-	-	72	74	1,700
36	5	490	480	-	444	-	260	-	520	-	-	-	-	44	120	2,358
37	7	1200	-	-	-	-	350	-	480	-	-	-	-	32	128	2,190
38	7	1380	-	-	-	-	190	620	-	-	160	-	-	46	120	2,516
39	6	420	-	-	-	-	350	-	320	-	-	-	-	84	74	1,248
40	7	860	-	-	444	-	210	-	410	-	-	-	-	38	76	2,038
41	5	710	-	-	-	140	310	-	350	-	-	46	140	36	68	1,800
42	2	840	-	-	-	-	190	-	-	-	240	-	-	-	70	1,340
43	5	560		-	444	-	350	580	-	-	-	-	-	64	76	1,694
44	2	460	-	-	-	-	250	-	-	44	160	-	-	58	78	1,050

45	5	240	481	150	-	-	210	-	-	68	-	-	-	64	64	1,277
46	4	320	-	-	444	-	310	-	530	-	-	-	-	78	56	1,294
47	5	420	-	-	444	-	270	700	-	-	180	-	-	62	78	2,154
48	6	580	-	-	-	130	340	-	480	-	-	132	168	76	76	1,982
49	2	640	-	-	-	-	250	-	630	-	-	-	-	-	42	1,562
50	3	720	-	-	-	-	210	-	-	41	240	-	-	-	48	1,259
51	4	540	-	-	-	-	350	620	-	-	-	-	-	-	56	1,566
52	6	640	-	-	-	-	310	-	510	68	-	-	-	-	28	1,556
53	5	780	480	-	-	-	370	-	-	68	220	-	-	-	78	1,996
54	7	750	-	-	444	-	210	630	-	-	-	184	320	-	62	2,156
55	3	740	-	-	-	-	350	-	470	-	280	-	-	-	68	1,908
56	4	710	-	-	-	-	290	-	430	-	-	-	-	84	60	1,574
Tot	265	**59,232**	**2,393**	**2,430**	**6,400**	**800**	**17,297**	**10,576**	**10,800**	**987**	**3,080**	**1,164**	**1,028**	**2,125**	**4,182**	**122,494**
%	100	**48.35**	**1.95**	**1.98**	**5.22**	**0.65**	**14.12**	**8.63**	**8.82**	**0.80**	**2.51**	**0.95**	**0.84**	**1.73**	**3.41**	**100**
Av.	4.73	**1.057**	**478.6**	**303.75**	**492.30**	**133.33**	**308.87**	**622.11**	**432**	**58.06**	**236.92**	**166.28**	**241.60**	**78.70**	**74.67**	**2,187.39**

Source of data: The summary data of questioners and field observation in Rantau Layung, 2005

Annex 8.1.c. Activities and household's labour time distribution in Muluy in 2006

HH. No.	No. of dependent	Activities and labour time spent (hour)													
		Farm	Store	Gov. Services	Log-ging	Fuel wood	Fish	Rattan	Ho-ney	Crafts	Hun-ting	Palm wine	Fruit and food	Others	Total
1	3	590	360	825	-	134	-	-	-	-	-	-	46	117	2,070
2	5	1,260	-	-	-	190	68	170	-	150	124	182	50	107	2,301
3	7	1,1160	-	547	228	150	66	170	-	-	144	-	64	57	2,586
4	4	1,270	-	-	-	22	70	170	18	-	146	-	32	48	1,776
5	8	1,250	-	-	228	38	-	170	18	-	106	-	82	87	1,979
6	5	790	-	-	-	190	88	174	18	-	160	-	54	32	1,506
7	5	970	-	-	345	120	108	174	18	-	130	-	96	139	2,100
8	7	1,150	-	-	345	130	140	174	18	-	-	-	48	50	2,055
9	3	1,018	-	-	-	150	-	174	-	25	180	-	24	218	1,789
10	4	1,278	-	-	-	150	-	-	18	100	-	-	48	115	1,709
11	6	1,168	-	-	228	210	86	102	18	-	186	-	56	160	2,714
12	5	1,093	-	-	-	74	90	102	18	50	-	-	82	123	1,632
13	4	1,150	-	-	-	96	60	110	18	-	-	-	64	208	1,706
14	2	752	-	-	-	30	64	110	18	-	132	-	32	129	1,287
15	3	1,160	-	-	228	120	50	-	-	-	150	-	38	180	1,296
16	5	1,110	-	-	-	58	66	120	18	-	-	-	22	90	1,484
17	5	1,150	-	-	-	120	78	120	18	-	-	-	44	220	1,750
18	4	930	-	-	228	134	80	120	-	75	-	-	26	53	1,646
19	3	810	480	-	-	40	-	120	-	-	130	-	38	78	1,696
20	6	1,070	-	-	-	50	72	120	18	-	-	-	48	50	1,428
21	9	1,160	-	-	345	74	-	120	-	50	132	496	58	175	2,610
22	3	968	-	-	228	70	64	-	18	-	-	-	34	97	1,479
Total	106	**23,337**	**840**	**1,372**	**2403**	**2,400**	**2,250**	**2,520**	**252**	**450**	**1,720**	**678**	**1,056**	**2,640**	**40,915**
%		**57,03**	**2.05**	**3.35**	**5.87**	**5,86**	**3.68**	**6.15**	**0.62**	**1.09**	**4.20**	**1.65**	**2.58**	**6.45**	**100**
Aver.	4.82	**1,060.77**	**420**	**685**	**267**	**109.09**	**140.62**	**140.0**	**18**	**75**	**143.33**	**339**	**48**	**120**	**1,859.77**

Source of data: Summary of questioners and field observation in Muluy 2006

Appendix 8.2.a. Activities, output, and monetary values in Rantau Layung in 2005

HH No.	Activities and monetary values (in million Rupiah)														
	Farm	Store	Mi ning	Log- ging	Tra- de	Non-timber forest products (NTFPs)									Total
						F.wood	Fish	Rattan	Ho ney	Crafts	Hun ting	P. wine	Fruit	Others	
1	-	-	-	-	-	0.397	0.579	0.648	-	-	-	-	-	.9.715	11.339
2	1.400	-	-	-	-	0.360	-	-	-	-	-	-	-	1.327	3.087
3	0.560	-	-	9.360	-	0.225	0.551	-		-	-	-	1.006	2.295	13.997
4	0.840	-	-	14.200	-	0.334	-	0.305	-	-	-	-	-	2.633	19.312
5	2.800	-	0.250	-	-	0.333	-	0.805	0.560	-	-	-	-	9.344	14.436
6	5.600	-	-	-	-	0.335	0.473	2.620	-	-	0.910	-	1.050	9.250	14.638
7	2.800	12.240	-	5.400	-	0.350	0.546	-	-	-	-	-	-	1.610	22.936
8	-	-	-	-	-	0.426	-	-	-	-	-	-	0.988	1.405	3.814
9	1.680	-	0.400	-	-	0.430	-	-	-	-	-	-	-	10.566	12.076
10	1.400	-	-	-	-	0.330	0.436	-	-	-	-	-	0.752	1.788	4.706
11	2.240	-	-	17.200	-	0.426	0.582	-	-	-	-	-	-	1.460	22.908
12	0.560	-	-	-	-	0.330	-	-	0.595	-	-	-	0.892	1.422	3.795
13	0.280	-	-	-	-	0.345	0.483	0.150	-	-	-	-	-	0.725	1.983
14	2.800	-	-	5.100	-	0.385	-	1.860	-	-	0.732	-	-	1.200	12.077
15	2.800	4.680	-	-	-	0.350	-	1.005	0.647	-	-	-	-	1.302	8.180
16	-	-	-	15.290	-	0.372	0.509	1.660	0.577	-	0.932	-	0.402	0.608	20.350
17	5.600	-	-	-	-	0.396	-	0.850	0.647	-	-	-	-	10.568	14.925
18	2.800	-	0.400	-	-	0.405	-	0.875	-	-	-	2.100	-	1.207	9.787
19	0.560	-	-	-	-	0.429	0.535	-	-	-	-	-	0.892	1.606	4.022
20	0.280	-	-	-	-	0.252	-	-	-	0.525	-	-	-	1.840	2.897
21	2.800	-	-	-	-	0.334	-	0.890	-	-	-	-	-	1.396	5.312
22	0.840	-	-	-	-	0.227	-	-	-	0.578	-	-	1.067	1.840	2.672
23	5.600	-	-	-	-	0.350	-	2.015	0.595	-	-	-	1.268	1.916	11.208
24	5.600	-	-	7.2000	-	0.368	-	2.115	-	-	-	-	-	2.672	17.955

25	0.800	-	0.230	-	-	0.319	0.452	0.740	-	-	-	-	1.102	2.147	5.790
26	0.840	-	-	-	-	0.360	-	-	-	-	-	-	-	1.752	2.952
27	2.800	-	-	-	-	0.373	-	-	-	0.465	-	-	-	1.196	4.825
28	-	-	-	-	-	0.352	-	0.680	-	-	-	-	-	2.128	2.160
29	1.400	4.800	-	-	0.630	0.340	-	0.740	-	-	-	-	0.700	1.967	9.934
30	1.400	-	-	-	-	0.320	-	-	0.682	-	-	-	0.403	1.740	4.545
31	-	-	0.800	6.300	-	0.420	-	-	-	-	0.799	-	0.332	1.564	10.615
32	1.400	-	-	-	-	0.319	-	-	0.752	-	-	-	-	0.976	3.447
33	1.680	-	-	-	-	0.373	0.478	0.605	0.647	-	-	-	-	1.327	5.110
34	2.800	-	-	-	-	0.202	-	0.650	-	-	-	-	0.367	1.207	5.225
35	2.800	5.600	-	-	1.200	0.270	-	-	0.595	-	-	-	1.102	0.650	11.217
36	2.800	-	-	-	-	0.315	-	1.050	0.647	-	-	-	-	0.348	5.980
37	2.800	-	0.570	-	-	0.360	0.431	0.685	0.577	0.440	-	2.450	-	9.573	10.385
38	1.400	-	-	-	-	0.349	-	-	0.542	-	-	-	-	2.594	6.085
39	1.400	-	-	5.400	-	0.364	-	-	-	-	-	-	0.245	1.136	8.545
40	2.800	-	-	-	-	0.325	0.462	-	0.402	-	-	-	-	1.278	3.875
41	0.800	-	-	-	-	0.276	0.631	0.257	0.717	-	1.376	-	0.638	1.652	4.347
42	-	-	-	-	-	0.330	-	-	0.718	-	-	-	-	2.734	4.782
43	1.540	-	0.340	-	-	0.199	-	-	-	-	-	-	-	1.602	4.141
44	0.840	-	-	12.600	-	0.234	0.644	-	-	-	-	-	0.647	1.350	15.671
45	8.400	-	-	-	-	0.333	-	1.315	0.595	-	-	-	-	10.097	20.740
Total	**88.540**	**27.320**	**2.990**	**98.050**	**1.830**	**15.222**	**7.792**	**22.520**	**10.495**	**2.008**	**4.749**	**4.550**	**13.853**	**135.710**	**435.632**
%	**20.32**	**6.27**	**0.68**	**22.50**	**0.42**	**3.49**	**1.78**	**5.16**	**2.40**	**0.46**	**1.09**	**1.04**	**3.17**	**31.15**	**100**
Average	**1,967.55**														

Source of data : The summary of the questioners, interview, and field/households observation in Rantau Layung conducted in 200

Appendix 8.2.b. Activities, outputs and monetary values in Pinang Jatus in 2005

HH No.	Activities and monetary values (in million Rupiah)														
	Farm	Store	Gov. services	Log-ging	Trade	Non-timber forest products (NTFPs)									Total
						F. wood	Fish	Rattan	Honey	Crafts	Hun ting	P. wine	Fruit / foods	Other NTFPs	
1	2.080	-	-	34.000	-	0.569	2.132	-	-	-	-	-	0.674	0.550	40.004
2	1.899	-	6.000	-	-	0.448	-	1.701	0.560	-	-	-	0.696	0.654	11.958
3	2.234	-	-	7.000	-	0.534	1.170	-	-	-	-	-	0.652	0.636	12.226
4	2.178	-	3.000	-	-	0.480	1.768	-	-	-	-	-	0.620	0.619	8.665
5	1.899	-	-	-	-	0.491	1.352	-	-	-	0.710	-	0.609	0.636	5.697
6	2.736	-	-	-	-	0.419	-	1.423	-	-	-	-	0.674	0.602	5.854
7	3.630	-	-	7.000	-	0.534	-	1.118	-	-	1.132	-	0.478	0.723	14.615
8	3.900	-	-	-	1.800	0.491	-	-	0.560	0.728	-	-	0.576	0.946	9.001
9	3.356	-	12.200	-	-	0.505	1.456	1.423	-	-	-	-	0.544	0.344	19.828
10	0.949	-	10.040	12.000	-	0.417	1.508	-	-	-	-	-	0.500	0.619	17.033
11	1.256	-	5.760	-	-	0.488	0.832	1.660	-	-	-	-	-	0.654	10.650
12	2.457	-	-	-	1.950	0.488	-	-	0.560	0.794	-	-	0.631	0.636	7.516
13	1.899	-	-	14.000	-	0.563	-	0.847	-	-	-	-	0.674	0.568	18.551
14	2.290	-	-		-	0.534	-	-	0.385	-	-	-	0.846	0.602	4.657
15	2.122	-	-	12.000	-	0.390	2.163	-	-	-	-	-	0.576	0.671	17.922
16	1.675	-	-	-	-	0.419	1.690	-	-	-	-	-	0.565	0.550	4.899
17	1.731	-	-	-	-	0.505	1.352	-	-	-	3.553	-	-	0.413	7.554
18	2.345	0.723	-	-	-	0.563	-	0.867	-	-	-	-	0.478	0.619	5.595
19	3.127	-	-	7.000	-	0.534	-	0.711	-	-	-	-	0.500	1.205	13.077
20	3.072	-	-	-	-	0.448	-	-	0.280	0.728	-	0.814	-	1.032	6.374
21	1.256	-	-	12.000	-	0.491	-	-	0.280	-	-	0.936	-	0.619	15.582
22	1.117	-	-	14.000	-	0.534	-	0.779	-	-	-	-	-	0.550	16.980
23	1.675	-	-	-	2.400	0.448	-	-	0.280	0.927	-	-	0.870	0.585	7.185
24	1.340	-	-	-	-	0.505	-	1.321	-	-	-	-	-	0.413	3.579
25	2.010	-	-	7.000	-	0.567	-	0.948	-	0.861	-	-	-	0.636	12.022
26	2.401	-	-	7.000	-	0.390	-	1.491	-	-	3.508	-	-	0.378	15.168
27	2.736	-	-	-	-	0.592	-	-	0.280	0.927	-	-	0.696	0.585	5.816

28	1.145	0.693	-	-	1.800	0.361	-	1.829	-	-	-	-	-	0.602	6.430
29	0.893	-	-	-		0.390	-	1.829	-	-	-	-	-	0.671	3.783
30	2.457	-	-	-		0.679	1.508	-	0.647	-	-	-	-	0.964	4.747
31	1.284	-	-	14.000		0.505	-	-	0.385	-	-	-	0.456	0.912	17.542
32	2.010	-	-	-		0.390	-	-	0.630	-	-	-	0.587	0.705	4.322
33	1.061	-	-	-	-	0.303	-	-	0.630	-	-	-	0.413	0.705	3.112
34	0.670	-	3.000	-	-	0.245	-	-	0.630	-	-	-	0.674	0.654	5.873
35	0.781	-	3.000	-	-	0.303	2.376	-	-	-	-	-	0.783	0.636	7.879
36	1.368	0.720	-	7.000	-	0.375	-	1.762	-	-	-	-	0.478	1.032	12.735
37	3.351	-	-	-	-	0.505	-	1.626	-	-	-	-	0.348	1.101	6.931
38	3.854	-	-	-	-	0.274	1.612	-	-	0.529	-	-	0.500	1.032	7.801
39	1.172	-	-	-	-	0.505	-	1.084	-	-	-	-	0.913	0.636	4.310
40	2.401	-	-	7.000	-	0.303	-	1.389	-	-	-	-	0.413	0.654	12.160
41	1.982	-	-	-	2.100	0.505	-	1.186	-	-	0.510	0.612	0.391	0.585	7.871
42	2.345	-	-	-	-	0.274	-	-	-	0.794	-	-	-	0.602	4.015
43	1.563	-	-	-	-	0.505	1.508	-	-	-	-	-	0.696	0.654	4.926
44	1.284	-	-	-	-	0.361	-	-	0.385	0.861	-	-	0.631	0.671	4.193
45	0.670	0.721	3.000	-	-	0.303	-	-	0.595	-	-	-	0.696	0.550	6.535
46	0.893	-	-	-	-	0.448	-	1.716	-	-	-	-	0.846	0.482	4.385
47	1.172	-	-	7.000	-	0.390	1.820	-	-	0.596	-	-	0.674	0.671	12.323
48	1.619	-	-	-	1.950	0.491	-	1.626	-	-	1.465	0.735	0.826	0.654	9.366
49	1.787	-	-	-	-	0.361	-	2.134	-	-	-	-	-	0.361	4.643
50	2.010	-	-	-	-	0.303	-	-	0.385	0.794	-	-	-	0.413	3.905
51	1.508	-	-	-	-	0.505	-	-	-	-	-	-	-	0.482	2.495
52	1.787	-	-	-	-	0.448	1.612	1.728	0.595	-	-	-	-	0.232	6.402
53	2.178	0.720	-	-	-	0.534	-	-	0.595	0.728	-	-	-	0.671	5.426
54	2.094	-	-	-	-	0.303	1.638	-	-	-	2.043	1.400	-	0.533	8.011
55	2.066	-	-	-	-	0.505	-	1.592	-	0.927	-	-	-	0.585	5.675
56	1.982	-	-	-	-	0.419	-	1.457	-	-	-	-	0.913	0.516	5.287
Tot	**109.560**	**3.590**	**46.000**	**168.000**	**12.000**	**25.000**	**27.500**	**36.600**	**8.640**	**10.200**	**12.926**	**4.500**	**23.120**	**36.000**	**523,641**
%	**20.94**	**0.68**	**8.57**	**32.08**	**2.29**	**4.77**	**5.37**	**6.98**	**1.67**	**1.96**	**2.46**	**0.85**	**4.41**	**6.97**	**100**
Av.	**1.956**	**0.718**	**5.750**	**11.200**	**2.000**	**0.446**	**1.527**	**1.464**	**0.540**	**0.600**	**1.846**	**0.900**	**0.625**	**0.642**	**9,350.73**

Notes : This data is the aggregate of the questioners, interview, and field/households observation in Pinang Jatus conducted in 2005. Av = average, is the total output value divided by the number of households involved.

Appendix 8.2.c. Activities, outputs, and monetary values in Muluy in 2006

HH No.	Activities and monetary values (in million Rupiah)													
	Farm	Store	Log ging	Gov. services	Non-timber forest products (NTFPs)									Total
					F.wood	Fish	Rattan	Honey	Crafts	Hun ting	P. wine	Food & Fruit	Others	
1	1,065	1,074	-	9,000	0.672	-	-	0.642	-	0.259	2,268	0.128	0.587	15,695
2	2,179	-	-	-	0.840	0.225	3,088	-	0.186	0.301	-	0.140	0.764	7,723
3	2,013	-	1,446	3,000	0.720	0.207	3,088	-	0.031	0.305	-	0.179	0.664	11,653
4	2,196	-	-	-	0.336	0.242	3,088	0.642	0.124	0.221	-	0.089	0.519	7,457
5	2,163	-	1,446	-	0.384	-	3,088	0.642	-	0.334	-	0.229	0.724	9,010
6	1,397	-	-	-	0.340	0.259	3,088	0.642	0.062	0.272	-	0.151	0.801	7,012
7	1,697	-	4,200	-	0.630	0.121	3,088	0.642	-	-	-	0.268	0.829	11,475
8	1,996	-	4,200	-	0.460	0.363	3,088	0.642	-	0.376	-	0.134	0.648	11,907
9	1,777	-	-	-	0.720	-	-	-	-	0.389	-	0.067	0.994	3,947
10	2,176	-	-	-	0.720	-	-	0.642	-	0.276	-	0.134	0.781	4,729
11	2,626	-	1,466	-	0.960	0.242	2,536	0.642	-	0.313	-	0.156	0.873	9,814
12	1,901	-	-	-	0.492	0.272	2,536	0.644	-	0.272	-	0.229	0.797	7,143
13	1,998	-	-	-	0.558	0.225	2,674	0.644	-	-	-	0.179	0.978	7,256
14	1,331	-	-	-	0.420	0.190	2,674	0.644	-	-	-	0.089	0.809	6,157
15	2,013	-	1,466	-	0.630	0.207	-	-	-	-	-	0.106	0.925	5,347
16	2,096	-	-	-	0.444	0.207	3,419	0.644	-	-	-	0.089	0.732	7,631
17	1,996	-	-	-	0.720	0.242	3,419	0.644	-	-	-	0.061	0.990	8,072
18	1,630	-	1,466	-	0.672	0.259	3,419	-	0.093	-	-	0.123	0.656	8,318
19	1,430	1,428	-	-	0.390	-	3,419	-	-	-	6,181	0.072	0.595	13,515
20	1,867	-	-	-	0.420	0.242	3,419	0.644	-	-	-	0.106	0.861	7,559
21	2,013	-	4,200	-	0.492	-	3,419	-	0.062	0.276	-	0.134	1,002	11,598
22	1,680	-	1,466	-	0.480	0.207	3,419	-	-	-	-	0.132	0.853	8,237
Total	**40.666**	**2.500**	**21,396**	**12,000**	**13.200**	**3.900**	**52.500**	**9.000**	**0.560**	**3.600**	**8.450**	**14.650**	**17.400**	**199,822**
%	**20.35**	**1.25**	**10.71**	**6.01**	**6.61**	**1.95**	**26.27**	**4.50**	**0.28**	**1.80**	**4.23**	**7.33**	**8.71**	**100**
Average	**1,848.45**	**113.63**	**972.55**	**545.45**	**1.418.18**	**177.27**	**2,386.36**	**409.09**	**0.025**	**163.64**	**384.09**	**665.91**	**790.91**	**9,082.82**

Source of data : Summary of questioners and field/households observation in Muluy in 2006

Appendix 9. Household and farming objects made with NTFPs, village level prices and replacement value

Objects (English)	Bahasa Indonesia	Paser (RL)	Price on village level In Rp.	Durability in year	NTFP material used	A	Rvt=QxV	**RVa=Rvt/Q**
Rice drying mat	Tikar jemur padi		150,000-360,000	20-30	Rattan	3	765,000	30,600
Sleeping mat	Tikar tidur		90,000-150,000	15-20	Rattan	2	240,000	6,857
Rattan bag	Tas gendong							
Tighly wooven	Anyaman rapat		15,000-25,000	2-20	Rattan	1	27,500	2,500
Loosely woven	Anyaman renggang		15,000-17,500	2-5	Rattan	3	48,750	13,929
Back-pack basket	Lanjung							
Tightly woven	Anyaman rapat		15,000	10-15	Rattan	5	75,000	6,000
Loosely woven	Anyaman renggang		10,000	2-3	Rattan	1	10,000	4,000
Back-pack boards	Sikutan/penyangkut							
Tighly woven	Anyaman rapat		15,000-20,000	2-5	Rattan	3	75,000	17,143
Loosely woven	Anyaman renggang		10,000-15,000	2-5	Rattan	2	10,000	8,571
Winnowing basket	Tampi		5,000	2-5	Bamboo and rattan	3	15,000	1,000
Baby carrier	Sikutan anak		15,000	10-20	Wood and rattan	1	15,000	20,000
Machete handle	Kepala mandau		3,000-5000	1	Wood and rattan	5	25,000	
Machete sheath	Sarung mandau		15,000-22,5000	1-2	Rattan	4	75,000	50,000
Scoop-net	Tangguk		7,500-12,500	1-2	rattan	1	10,000	7,500
Palm leaf hat without decoration	Topi tanpa kain		3,000-5,000	1-3	Licuala leaves and rattan	6	24,000	12,000
Fish trap	Bubu		3,500-5,000	0,3 to 1	Bamboo and rattan	1	4,250	4,250
Chicken coop/cage	Kurung ayam		3,500-5,000	1	Bamboo and rattan	4	4,250	4,250
∑RVt & ∑ RVa for stock of durable items / h							1,423,750	194,600
Game (deers)	Rusa, payau, kijang		5,000	Kg	per year 120			600,000
Raw rattan	Rotan mentah		500	Kg	2,5 tons per year			1,250,000
Honey	Madu		50,000	Liter	5 liter/year			250,000
Fruits (durians)	Buah durian		1,500	Buah(unit)	20 fruits per year			30,000
∑RVa for perishable NTFPs/household								2,180,000
Total RVa of NTFPs used per-household								2,279,600

Note: A = typical (rounded) amount of items per-household (h), RVa = Replacement value per-annum, Rvt = Replacement Value total

Appendix10. Price list of local wages, NTFP, their substitutes, and a few others important items marketed locally (Augustus 2005) in Rantau Layung.

Labor or products	unit	Price / unit in Ind. Rupiah (Rp.)
Local wage		
Carpenter (with planning machine)	1 day	35,000 plus fuel, food, cigarettes ~5,00
Chain saw operator (logging, clearing, construction)	1 day	65,000 plus fuel, food, and cigarettes ~ 5,000
Farm labor (farming; brushing, weeding, harvesting)	1 day	20,000
Field labor (HPH)	1 day	35,000
Field Labor (oil-palm)	1 day	25,000
Helper in logging	1 day	25,000
Kitchen (cooker) in camp	1 day	15,000
Forest products		
NTFP (game):		
Deer	1 kg	5,000
Wild boar meat	1 kg	3,500
Birds	1 bird	65,000 (depending on species)
Wild honey	1 liter	50,000
Reptile skins	Piece	50,000 for 200x18cm
Fish	1 kg	7,5000
Birds nests	1kg	3,6 mio white colour, 2 mio. black
NTFP (plant material) :		
Gutta Percha (Malau, BI, ketipai RL)	1 piece	1000 to 2000
Kulit kayu lem dry	1kg	1,500
Kulit kayu lem, wet	1kg	500
Mekai leaves	1bundle	1000
Pasak bumi	1kg	2000
Petai	1bundle	1,500 to 3000 (8 to 12 strings)
Rotan Segah	1kg	500
Rotan Jahab	1kg	450
Rotan Semambu	1kg	800
Timber:		
Timber logs, high grade, illegal prod. (e.g. Bangkirai) d>50 cm and length =4,2 m	1 m3	200,000
Timber other illegal prod. D>20-50cm length=4,2 m	1 m3	150,000

Woods (boards) illegal prod.l= 4 m, thick 20x2cm	1 m3	300,000
Handicraft items and their substitutes		
With rattan		
Back pack basket plastic	1 piece	7,000
Back pack basket rattan	1 piece	10,000 to 15,000
Back pack boards	1 piece	10,000 to 15,000
Bag for men rattan segah	1 piece	15.000 to 17,500
Bag for woman rattan segah	1 piece	15,000 to 35,000
Fish trap and chicken cages, bamboo with rattan or wire	1 piece	3,5000 to 7,500
Mat, fine, plastic	1 piece	7,000 to 15,000
Mate,fine, rattan segah	1 piece	100,000 to 150,000
Mat,rough, pandanus	1 piece	5,000 to 10,000
Mat rough, rattan jahab	1 piece	150,000 to 350,000
Parang blade	1 piece	15,000 to 25,000
Parang handle (carved wood with rattan girth)	1 piece	5,000 to 12,500
Parang (whole set with blade, handle and sheath)	1 piece	15,000 to 25,000
Rice winnower, pandanus or bamboo	1 piece	5,000
Scoop net with rattan frame	1 piece	7,500 to 15,000
Seraung palm hat (without decoration)	1 piece	3,500 to 10,000
Seraung with decoration	1 piece	15,000 tp 25,000
Other:		
Glass pearl picture for baby carrier	1 piece	135,000
Gold pan, wooden	1 piece	20,000 to 25,000
One-log canoe	1 piece	335,000
Local agricultural and agroforestry products:		
Fruit		
Bananas	1 "hand" (sisir)	500 to 1,000
Banans, special desert var.	1 piece	750 to 1,500
Coconut mature (for "meat") price depends on the fruit size	1 piece	700 to 1200
Coconut (young for water)	1 piece	1,250
Langsat	1 kaleng	7,000
Mango	1 kg	1,500
Pineapple	1 fruit	1,500
Rambutan	1 kg	750
Protein sources		
Chicken (domesticated)	1 animal	45,000
Fish freshwater (river)	1 kg	5,000
Peanuts, village grown, peeled	1 kg	7,500

Coffee	1 kg	5,000
Candle nut (Aleoritus spp)	1 kg	6,000
Durians	1 piece	1,500
Cempedak	1 piece	500
Vegetables :		
Cucumber, yellow	1 fruit	500
Eggplant	3 pieces	750
Mung bean sprouts (kecambah)	1 bundle	500
Pumpkin, yellow	1 fruit	750
Spinach, bitter(sawi)	1 bundle	500
Spinach, sweet (sawi manis)	1 bundle	1000
String beans, long green (kacang panjang)	1 bundle	750
Other:		
Palm wine	1 kg	3000
Rice upland farming	1 kg	3,500
Industrial and imported good:		
Protein sources*:*		
Corned beef	1 can	2000
Egg, (batterey chicken eggs)	1 piece	1000
Fish, dry salt fish	1 kg	8000
Sardines, canned	1 can	3,000
Tempe	1 package (0.5 kg)	600
Tofu/tahu	1 package (0.5kg)	750
Vegetables:		
Cabbage, white	1 kg	3,000
Cauliflower	1kg	3,000
Garlic	1kg	
Onions, small red	1kg	6,000
Tomato	1kg	3,500
Other :		
Cigarettes (gudang garam 16)	1 package	7,500
Instant noodle	1 piece	1,000
Salt	200 gr	500
Soda pop (coca cola, sprite)	1 piece	3,500
Sugar	1 box	6,500
Milk	250 ml	4000
Oil cooking (bimoli)	1 liter	5,500
Benzene Solar	1 liter 1 liter	7,000 5,000

Appendix11. Use of NTFP in other villages of Gunung Lumut Protection Forest

Village	Perkwin				Rantau Buta				M.Lam bakan				Belimbing				Bereweh			
No. households	34				24				46				26				12			
Gen.economic sit.	well				poor				well				well				poor			
Maj.tribe/religion	Paser/ mos.				Paser/mos.				Paser/mos				Paser/mos & Christ.				Paser/mos			
Distance from Protection Forest GL. area	17 km				3 km				12 km				22 km				27 km			
Pred. cash source :																				
Trade/transport.	1%				2%				2%				4%				-			
Rattan cult.	67%				88%				90%				60%				35%			
Small Logging	5%				20%				5%				9%				14%			
Farm	90%				98%				96%				87%				70%			
Employment	12%				7%				12%				6%				30%			
Other	Fees from logging				Small mining coal				Wood mill				Rice mill				Wood mills			
NTFPs:																				
	s	p	f	n	s	p	f	n	s	p	f	n	s	p	f	n	s	p	f	n
Honey	v	-	v	-	v	-	v	-	v	-	v	-	v	-	v	-	-	-	v	-
Rattan	v	-	v	-	v	v	v	-	v	-	v	-	v	v	v	-	v	-	v	-
Hunting deer	v	v	v	-	v	v	v	-	v	-	v	-	v	v	v	-	v	v	v	-
Live birds	-	-	v	-	-	-	v	-	v	v	v	-	v	v	v	-	v	v	v	-
Pasak bumi	-	-	v	-	v	-	v	-	v	v	v	-	-	-	-	v	-	-	v	-
Animal skins	V	-	V	-	V	-	V	-	V	-	V	-	V	V	V	-	V	-	V	-
Dart poison	-	-	V	-	-	-	V	-	-	-	V	-	-	-	-	V	-	-	-	V
Roots	-	-	V	-	-	-	V	-	-	-	V	-	V	-	V	-	-	-	V	-
Durian	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-
Cempedak	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-	V	-
Langsat	V	-	V	-	V	-	V	-	V	-	v	-	V	-	V	-	-	-	V	-
Ed. Birds nests	-	-	V	-	-	V	V	-	V	-	V	-	-	-	V	-	-	-	-	V
Wild boar	-	-	-	v	V	-	-	V	V	-	-	V	V	v	V	-	V	V	V	-
Petai beans	V	-	V	-	-	-	V	-	-	-	v	-	-	-	V	-	V	-	V	-
Trophies	V	-	V	-	-	-	V	-	V	-	V	-	V	-	V	-	V	V	V	-
Eagle wood	v	-	v	-	v	-	v	-	V	-	v	-	-	-	V	v	-	-	-	v
Candle nuts	V	-	V	-	-	-	V	-	-	-	V	-	V	-	V	-	V	-	V	-
Akar raya	-	-	V	-	-	-	V	-	-	-	V	-	-	-	V	-	-	-	V	V
Fish	-	V	V	-	-	v	V	-	-	-	V	-	V	V	V	-	-	V	V	-
Plant medicine	-	-	v	-	-	-	v	-	-	-	v	-	-	-	v	-	-	-	v	-

Note : Percentage indicates the number of households involved, one household often involved in some source of income.S = sold, P= Purcahsed, F= still usedN= no longer used

Appendix12. Hunting record in Muluy village in May to September 2006

Date	Species	Hunter	Amount	Weight	Place	Method of Hunting
May, 2004						
29	Payau	Basirun	1	50 kg	Gn. Janas	Jerat/ trapping
29	Payau	Basirun	1	20 kg	Gn. Janas	Jerat
28	Murai	Bahri	1	-	Sempangan	Glue
29	Payau	Jumu	2	50 kg	Sungai Rane	Jerat
June:						
2	Landak	Jamu	1		Sungai Rane	Catch
3	Payau	Nano	1	30 kg	Trans HTI	Jerat
4	Kijang	Ujiyan	1	14 kg	Wiring	Jerat
5	kijang	Riye	1	9 kg	Rane	Jerat
6	Payau	Atam	1	62 kg	Per	Jerat
7	Kijang	Pudel	1	10 kg	Wiring	Jerat
8	Kijang	Norsin	1	12 kg	Sempangan	Jerat
8	Payau	Jepen	1	80 kg	Sepu	Tangkap
10	payau	Mas Giman	1	90 kg	Trans HTI	Jerat
11	Kancil	Kilam	3	?	Wiring	Jebakan
12	Pelanduk	Sumantri	2	?	Wiring	Tongkop
12	Payau	Langsam	1	18 kg	Sempangan	Jerat
13	Payau	Pale	1	90 kg	Trans HTI	Jerat
14	Payau	Snawi	1	80 kg	Trans HTI	Jerat
16	Payau	Langsam	1	36 kg	Karombalo	Jerat
17	Payau	Nano	1	70 kg	Trans HTI	Jerat
19	Kijang	Norsin	1	12 kg	Sempangan	Jerat
21	Kijang	Riye	1	10 kg	Sempangan	Jerat
24	Kijang	Jumu	1	9 kg	Janas	Jerat
24	Payau	Kiyuk	1	78 kg	Tengkoloy	Jerat
25	Payau	Jumu	1	74 kg	Kenango	Jerat
24	Payau	Narung	1	46 kg	Bekuan	Jerat
28	Payau	Midan	1	48 kg	Kendango	Jerat
28	Payau	Sriedan	1	8 kg	Mayas	Jerat
30	Kijang	Sriedan	1	9 kg	Mayas	jerat
July:						
2	Payau	Jidan	1	64 kg	Janas	Jerat
3	Kijang	Sumantri	1	?	Doyam	Jerat
5	Payau	Norsin	1	?	Sempangan	Jerat
9	Murai	Jiham	2	-	Anjur	Glue
13	Kijang	Dehen	1	8 kg	Karembalo	Jerat
16	Payau	Pa' Lele	1	75 kg	Trans HTI	Jerat
16	Payau	Giman	2	185 kg	Trans HTI	Jerat
16	Payau	Uyan	1	?	Malomanu	Jerat

16	Payau	Giman	1	80 kg	Trans HTI	Jerat
17	Payau	Giman	1	90 kg	Trans HTI	Jerat
24	Payau	nano	1	85 kg	Trans HTI	Jerat
August:						
13	Payau	Giman	2	150 kg	Trans HTI	Jerat
16	Kijang	Kiyuk	1	9 kg	Monu	Jerat
27	Payau	Kumu	1	46 kg	Kondango	Jerat
27	payau	Longgung	1	63	Janas	Jerat
29	Payau	Langgung	1	66	Janas	Jerat
Total :						
Payau			31	1,853 kg		
Kijang			10	112 kg		
Kancil			1	-		
Landak			2	-		
Muri			3	-		
				1,965 kg		

Notes : this data was based on the diary bookeeping handed to the Kepala Adat of Muluy. Payau = deer (*Muntiacus muntjak*); Landak = *Hystrix crassispinis*; Kijang= *Cervus unicolor* ; Pelanduk =Tragulus javanicus.; Murai = birds. Jerat = trapping.

Appendix13 Attitudes to life in Pinang Jatus, Rantau Layung and Muluy, 2005.

	Pinang Jatus		Rantau Layung		Muluy	
How people feel about aspects of life	% Men	% women	% men	% women	% Men	% women
Think that plants from the forest are essential to life	100	100	100	100	100	100
Forest is considered as important to the family	90.0	95.0	95.7	89.1	92.8	93.3
Feel happy with life	85.7	91.7	93.0	95.8	83.3	86.2
Think children should stay in village	85.0	66.7	64.1	66.6	61.3	48.2
Life in the future is considered to be easier than at present	57.2	62.5	64.7	62.7	65.5	65.4
Think their lives would improve with a job or more money	23.8	43.0	50.75	50.75	53.2	32.1

Appendix 14 The relative importance of development issues, as indicated by mean scores assigned by men and women (Standard deviations shown in parentheses)

14.a. Pinang Jatus

Important for:	Education	Health	Nature & environment	Business development	Agricultural development	Tourism
MEN'S VIEWS						
The family	4.70	5.00	4.35	4.25	4.95	3.35
	(0.80)	(0.00)	(0.81)	(0.97)	(0.22)	(1.60)
The community	4.95	4.90	4.40	4.30	4.90	3.65
	(0.22)	(0.31)	(0.82)	(0.80)	(0.31)	(1.53)
Children's lifetime	4.85 ‘	4.95	4.35	4.50	4.90	3.85
	(0.49)	(0.22)	(0.88)	(0.69)	(0.31)	(1.53)
WOMEN'S VIEWS						
The family	4.70	4.50	3.05	3.85	4.10	2.90
	(0.73)	(0.69)	(1.47)	(1.84)	(1.25)	(1.86)
The community	4.81	4.48	2.90	4.00	4.38	2.86
	(0.51)	(0.68)	(1.70)	(1.41)	(0.86)	(1.86)
Children's lifetime	5.00	4.86	3.33	4.40	4.43	3.35
	(0.00)	(0.48)	(1.53)	(1.43)	(0.87)	(1.98)

14.b. Rantau Layung

Important for:	Education	Health	Nature & environment	Business development	Agricultural development	Tourism
MEN'S VIEWS						
The family	4.81 (0.60)	5.00 (0.00)	4.52 (0.72)	4.39 (1.17)	4.58 (1.26)	3.10 (1.70)
The community	5.00 (0.00)	5.00 (0.00)	4.81 0.48)	4.74 (0.63)	4.90 (0.40)	3.81 (1.7)
Children's lifetime	5.00 (0.00)	4.94 (0.36)	4.71 (0.53)	4.74 (0.58)	4.45 (1.29)	3.65 (1.84)
WOMEN'S VIEWS						
The family	4.93 (0.36)	5.00 (0.00)	4.63 (0.61)	4.73 (0.64)	4.93 (0.37)	4.20 (1.10)
The community	5.00 (0.00)	5.00 (0.00)	4.77 (0.50)	4.91 (0.40)	5.00 (0.00)	4.61 (1.00)
Children's lifetime	5.00 (0.00)	5.00 (0.00)	4.63 (0.61)	4.90 (0.31)	4.87 (0.43)	4.30 (1.09)

14.c. Muluy

Important for:	Education	Health	Nature & environment	Business development	Agricultural development	Tourism
MEN'S VIEWS						
The family	4.76 0.66	4.92 (0.37)	4.30 1.09	3.93 (1.13)	4.83 0.48)	2.67 (1.90)
The community	4.94 0.29	4.93 (0.35)	4.57 (0.89	4.08 (1.09)	4.94 0.23	3.10 (2.05)
Children's lifetime	4.94 0.29	4.96 0.27)	4.54 1.00	4.13 (1.07	4.81 0.49	3.46 (1.97)
WOMEN'S VIEWS						
The family	4 76 (0.87)	4.93 (0.35)	4 31 (1.12)	4.31 (0.93)	4.77 (0.64)	3.01 (1.97)
The community	4.92 (0.50)	4.92 (0.37)	4.52 (1.07)	4.45 (0.87)	4.90 (0.51)	3.41 (2.06)

Note: Figures show the mean scores assigned to each of the issues shown, when respondents gave a score from 0 to 5 to indicate the level of importance of each issue.

Summary

The use of forest products by the indigenous people in Indonesia have been a major concern of researchers and policymakers since the beginning of the Seventies and the distribution of the country's forest for logging concessions. This distribution was conducted without considering the value of non-timber forest products (NTFPs) for local people or their needs and their role in forest and environment conservation. There have been many indications that indigenous people face difficulties in fulfilling their daily needs due to decreasing numbers of NTFP resources – an result of exploitation by logging concessions.

The increasing demands for the recognition of indigenous people's rights to natural resources and resource management in East Kalimantan is also result of increased international attention for development issues and, in particular, indigenous people's right to resources. East Kalimantan is one of the regional focuses of these studies and, in particular, the Mahakam Basin. One of the important aspects of these studies is the use of non-timber forest products and its socio-economic values for indigenous people. This is particularly important in the region where non-timber forest products play an important role for rural households, such as in the central part of Kutai and the northern part of the Mahakam River, in areas such as Muara Lawa and West Kutai. However, thus far, Paser District has failed to gain sufficient attention. This study of NTFPs economic value in Paser District is expected to contribute more comprehensive information on the use of non-timber forest products in East Kalimantan.

Another reason for the economic valuation of NTFPs in Paser is to examine the current government policy regarding their management, which views forest value as being much more related to timber and timber products. The forestry sector and its related institutions pay more attention to timber as a main product of the forest and disregard the role of non-timber forest products in the forest ecosystem and for the economy of indigenous people in terms of forest management. The government's view,

that NTFPs are not important products in forest management, can be derived from two main factors: first, the high prices of timber, which makes the contribution of timber export very significant to the Indonesian (government) economy. This is in contrast with non-timber forest products, which are often invisible in the market, difficult to access, and their contribution to government revenues is very small. Second, the role of NTFPs in indigenous people's livelihoods, and for the environment, for the forest ecosystem and nature, and for the future development of human needs has, up to now, been poorly understood, not least due to the lack of research in this area. These two reasons caused non-timber forest products to be undervalued and, ultimately, neglected in the allocation of natural forest for logging concessions and for other forest conversions. The lack of attention by government and policymakers to NTFPs has also had a serious impact on the sustainability of forest and non-timber forest products, and it tends to marginalize indigenous peoples.

My research was conducted in an effort to show how the forest and its resources play an important role in the livelihoods of the Dayak indigenous people of Paser. It is conducted with the aim of assessing and evaluating the importance of NTFPs in indigenous people's household economy, by determining the number of wild plants and animals used for households needs. The assessment includes the use of NTFPs for household subsistence needs, for markets or cash income, as well as for cultural and spiritual values. This study also collects indigenous peoples' perceptions on current development issues relating to both forest and environmental conditions. After collecting the number of NTFPs used in all households the second step of study was to conduct the economic valuation of each NTFP in order to generate the monetary values of all NTFPs at the household and village levels. The monetary value of each product was estimated on the basis of their extraction volume at the household level, which was determined by the consumption and market selling volume of each NTFP at household level. This volume is then multiplied by the price of each product. The price of the product was determined using two methods: market base techniques and the contingent valuation methods. Data collections were made at various levels of indigenous peoples' activities, including in the forest, at home and at the nearest market, by following the flow of the products. The market chain traced begins from farmers or household level until the end user of the products in the city or market near the research area. Various methods of interviews and field measurements of natural and socio-cultural aspects of forest and non-timber forest products were employed to generate data for the study.

The selection of the Gunung Lumut region for field study follows the framework of the Tropenbos Kalimantan Programme, the Trade-off of Biodiversity Project in Gunung Lumut Protection Forest and Extension Area of the District of Pasir in East Kalimantan. The Trade-off Biodiversity Project was developed with the aim to formulate recommendations on the integration of forest exploitation, timber and non-timber forest products and to serve local people and biodiversity conservation. The research project was started following an agreement by Tropenbos International, the Institute of Environmental Sciences (CML), Leiden University and the Faculty of Forestry of Mulawarman University-Samarinda, Indonesia. Gunung Lumut region is a protected area but inhabited by the indigenous people of Paser and six former logging concession areas.

From the data collection perspective, this study represents 123 households, with 577 inhabitants, in three different Paser indigenous villages as a main data source. Each village studied has a different access to market and government development programmes. The average number of household members is four. The village economic status is in the form of transition, from barter to cash income or individual methods. Data collection was made in the period 2004 to 2007. Consequently, the data and information in this study represents only the condition and the situation in these years.

The assessment of the use of forest plants and forest wild animals in village research revealed that Paser indigenous people used more than 299 plants for various purposes, such as: for construction materials, for fuel wood, for food sources and for vegetables, for medicines and for various cultural rituals or amenities. 29 wild species of animals were used as meat sources, for skins and for trophy, for game and for fun, and for rituals.

The calculation of forest products' monetary values in the household economy of Paser indigenous people shows that the forest contributed Rp. 9,391,048 to the households' annual budget and 30 per cent of this was derived from non-timber forest products. In terms of residual values, the average forest resource contribution to the household economy is Rp. 1,517,969 per year. This indicates that the forest and forest products are the main source of the livelihoods of the Paser people.

This study also demonstrates a method of assessment of the actual use-values of non-timber forest products in monetary terms. The calculated figures of the use-value of forest products also represents the value added to labour and capital inputs by the use of the primary resources: land and forest. It is suggested that it would certainly be in the interest of the Pasir District's policymakers to look more carefully at the total forest income potential of forest resources, rather than concentrating solely on timber income. It is also suggested that forest land should be not viewed as a solution for industrial development, such as oil palm development, in which forest resources have not been properly evaluated.

This monetary value can be used by policymakers or government agencies to impose compensation for local people who have lost their access to forest resources as a consequence of forest conversion or forest allocation for logging concessions or for palm oil plantations. This value can also be used as a preliminary calculation for the assessment of externalities if forests are to be converted or changed for other agriculture development programmes.

The current government programme in the research area indicates that the use of plants and wild animals by the indigenous people of Paser is perceived as unimportant for aspects of forest function. This can be observed by the high forest conversion rate in the last decade, for agriculture purposes such as palm oil, timber estate industries and coal mining, which is damaging non-timber forest products resources. This condition was triggered by the policy that did not show the economic values of NTFPs in monetary terms of government expenditures and policymakers were not aware of these values. This view influenced the methods of forest management, which tended to value forest products for market only without considering their role for the economy of indigenous people, and, ultimately resulted in unsustainable use of the forest.

There is no doubt from the results of this study that the importance of NTFPs has not been highlighted in the government programme for timber exploitation and forests conversion for agriculture development. It is clear, too, that the people in the research villages would be significantly worse off if no forest existed for their use.

The economic valuation of forest resources, as discussed in this study, is designed to make the value of forest use explicit, and not necessarily to put a total value on nature. As one can note in the literature, there has been much interest in estimating the total economic value (TEV) of forests. The discussion of economic value and non-economic dimensions of the forest in this study has increased the (monetary) value of the forest, even though this is still far from the description of the Total Economic Value (TEV). This means that it is necessary to undertake further study in the Gunung Lumut region in order to capture the TEV of this area for local people and the environment. Different values can be generated by a particular situation and by different techniques. The TEV of Gunung Lumut can be estimated by the sum of the various values.

This study defines and analyses the importance of non-timber forest products (NTFP) as a component of the resource base of tropical forest. Following a discussion of currently used valuation techniques, an attempt has been made to quantify the use-value of these products in monetary terms. Although, clearly, the value of an ecosystem goes far beyond its direct use value, an identification of such use-values in this study forms the basis of an estimate of the total economic value of the Gunung Lumut resource.

The ecological importance of non-timber forest products is still not fully understood, but some aspects of this have been discussed in my study, along with an account of strategies for forest management. An outline of the state of forest resources and their role in the Paser context, provides an estimate, through this study and on the basis of the methodology used here, a monetary value for NTFPs used by Paser indigenous people. This should be considered by the local government as a way to promote the importance of NTFPs for forest management and sustainable development.

Samenvatting

Het gebruik van bosproducten door inheemse volken in Indonesië is een belangrijk onderwerp van onderzoekers en beleidsmakers geweest in het begin van de jaren '70 van de vorige eeuw omdat de bossen ernstig verstoord werden door houtkapmaatschappijen. Deze verstoring vond plaats zonder enige zorg voor de betekenis en de behoeften van de zgn. bosbijproducten of de niet-houtbosproducten voor de lokale mensen of de inheemse gemeenschappen of voor hun rol voor het beheer van het bos en de natuurbescherming. Er zijn veel aanwijzingen dat inheemse volken problemen ondervinden bij het bevredigen van hun dagelijkse behoeften vanwege de achteruitgang van de bosbijproducten door de impact van de exploitatie van de bossen door houtkapmaatschappijen.

De toenemende behoefte aan erkenning van de rechten van inheemse volken ten aanzien van natuurlijke hulpbronnen en het beheer erover in Indonesië was ook een gevolg van de internationale ontwikkeling op dit gebied. Oost-Kalimantan is in dit opzicht de regionale focus in Indonesië en het stroomgebied van de Mahakam rivier is dit in het bijzonder. Eén van de belangrijke aspecten van deze studies is het gebruik van bosbijproducten en hun sociaal-economische betekenis voor inheemse volken. Dit is in het bijzonder van belang in het gebied waar bosbijproducten een grote rol spelen in rurale huishoudens zoals in het centrale deel van het district Kutai en het noordelijke deel van de Mahakam rivier, zoals in districten Muara Lawa en West-Kutai. Het Paser district daarentegen kreeg nauwelijks belangstelling en daarom heb ik mij gericht op de studie van de economische betekenis van bosproducten om zodoende een bijdrage te kunnen leveren aan de kennis over het gebruik van bosbijproducten in Oost-Kalimantan.

Een ander element in de studie van de economische betekenis van bosbijproducten in Paser is gerelateerd aan het huidige overheidsbeleid dat veel meer is gericht op hout en houtproducten. De bosbouwsector en de hieraan gerelateerde instellingen besteden veel meer aandacht aan hout als het belangrijkste bosproduct en zij verwaarlozen de rol van bosbijproducten voor de economie van de inheemse gemeenschappen en voor het bosbeheer. De redenen waarom de overheid zo weinig aandacht besteedde aan de bosbijproducten bij het beheer van het bos zijn tweeledig: ten eerste was de prijs van hout hoog waardoor houtexport een belangrijke bijdrage leverde aan de Indonesische economie, terwijl de bosbijproducten in de markt grotendeels onzichtbaar waren. Hun omvang en betekenis zijn moeilijk in te schatten en het belang ervan voor de overheid is zeer klein. Ten tweede was de rol van bosbijproducten voor het leven van inheemse volken en voor de natuur en het bosecosysteem, en ook voor de toekomstige bevrediging van menselijke behoeften, niet goed begrepen vanwege onvoldoende onderzoek. Door deze twee redenen werden bosbijproducten ondergewaardeerd en soms zelfs genegeerd bij de toewijzing van natuurlijk bos aan houtkapmaatschappijen en ten behoeve van andere bestemmingen via bosconversie. Gebrek aan aandacht voor bosbijproducten van de kant van de overheid en de beleidsmakers heeft een serieuze impact gehad op de duurzaamheid van het bosgebruik, inclusief de bosbijproducten. Het heeft ook bijgedragen aan de marginalisering van de inheemse volken.

Mijn onderzoek is gericht op een poging om aan te tonen hoe het bos en de daarin besloten natuurlijke hulpbronnen een belangrijke rol spelen in het bestaan van de inheemse Dayak bevolking in Paser. Het is gedaan met het doel het belang van bosbijproducten voor de economie van huishoudens van de inheemse bevolking te beoordelen door het aantal wilde planten en dieren dat gebruikt wordt voor huishoudbehoeften vast te stellen. Deze beoordeling omvat het gebruik van niet-houtbosproducten voor eigen gebruik, voor verkoop en voor de markt, en voor culturele en spirituele waarden. Deze studie heeft zich ook gericht op de percepties van de lokale bevolking met betrekking tot de huidige bos- en milieuomstandigheden. Na het verzamelen van gegevens over het gebruik van bosbijproducten op huishoudniveau, is een tweede stap gezet om de economische waardering van alle producten die hiermee gemaakt worden, vast te stellen zowel op huishoud- als op dorpsniveau. De waarde van ieder product, uitgedrukt in geld, werd geschat op basis van de totale beschikbare hoeveelheid op huishoudniveau, en die werd bepaald door de consumptie en de hoeveelheid van ieder bosbijproduct die op de markt werd gebracht. Deze hoeveelheid werd dan vermenigvuldigd met de prijs van ieder product. Deze prijs werd op twee manieren bepaald: technieken gebaseerd op de markt en diverse waarderingsmethoden. Dataverzameling geschiedde op het niveau van de activiteiten van lokale bevolking. Deze omvatten activiteiten in het bos, thuis en op de lokale markten waarbij telkens de stroom van de producten werd gevolgd. De marktketen begon telkens bij de boeren of op huishoudniveau en liep tot de eindgebruiker van de producten in de stad of de markt in de buurt van het onderzoeksgebied. Verschillende interviewtechnieken en veldmethoden om de ecologische en de sociaal-culturele aspecten van bos en bosproducten vast te stellen werden gebruikt om de gegevens voor deze studie te verzamelen.

De selectie van de Gunung Lumut regio als veldlocatie werd bepaald in het kader van het Tropenbos Kalimantan Programma en in het bijzonder het *Trade off*

Biodiversity Project in en rond het beschermde gebied van Gunung Lumut van het Paser district in Oost-Kalimantan. Dit *Trade off Biodiversity Project* was opgezet met het doel aanbevelingen te formuleren voor de integratie van bosexploitatie, hout en bosbijproducten en was mede gericht op de behoeften van de lokale bevolking en biodiversiteitbescherming. Het onderzoeksproject was geformuleerd op basis van een overeenkomst tussen Tropenbos International, het Instituut voor Milieuwetenschappen van Universiteit Leiden (CML) en de Bosbouw Faculteit van Mulawarman University in Samarinda (Oost-Kalimantan). Gunung Lumut is een beschermd gebied dat wordt bewoond door de Paser bevolking. In het verleden waren er zes houtkapmaatschappijen actief.

De dataverzameling waarop deze studie is gebaseerd, bestaat vooral uit de studie van 123 huishoudens in drie verschillende dorpen van de inheemse Paser bevolking en gegevens verkregen uit twee additionele dorpen. In totaal omvat de studie gegevens over 577 mensen. Alle dorpen die zijn opgenomen in de studie, verschillen van elkaar ten aanzien van toegang tot de markt en de mate waarin de overheid ontwikkelingsprogramma's tot uitvoering brengt. Het gemiddelde aantal mensen dat tot een huishouden behoort, ligt rond de vier. Alle dorpen bevinden zich in verschillende stadia van economische transitie, die loopt van een ruileconomie naar een economie gebaseerd op cashstromen. Verzameling van gegevens vond plaats in verschillende perioden tussen 2004 en 2007. De informatie en analyse ervan zijn daarom dan ook gebaseerd op de situatie in deze jaren.

De analyse van het gebruik van bosplanten en de wilde dieren uit het bos in de onderzoeksdorpen tonen aan dat de Paser bevolking meer dan 300 planten gebruikt voor verschillende doeleinden zoals voedsel, medicijnen, constructiemateriaal, brandhout, diverse religieuze rituelen en andere behoeften. Tenminste 29 soorten wilde dieren worden gebruikt voor hun vlees, voor hun huiden. Dieren of hun producten worden ook gebruikt bij rituelen.

De berekening van de monetaire waarde van de bosproducten in de huishoudeconomie van de Pasir bevolking toont aan dat deze Rp 9.391.048 bedraagt in het gemiddelde huishoudbudget en dat 30% hiervan afkomstig is van de bosbijproducten. Dit geeft aan dat het bos en de bosproducten de belangrijkste bron van bestaan is voor de Paser bevolking.

De studie demonstreert ook een waarderingsmethode van de feitelijke gebruikswaarde van bosbijproducten uitgedrukt in geld. De berekende cijfers van de gebruikswaarde van de bosproducten reflecteert tevens de toegevoegde waarde van de arbeid van de kapitaalsinput bij het gebruik van de primaire hulpbronnen land en bos. Gesuggereerd wordt dat het zeker van belang zou zijn als de beleidsmakers van het Paser district nauwkeuriger zouden kijken naar het potentieel van het totale inkomen uit de hulpbronnen uit het bos, in plaats van zich uitsluitend te richten op het inkomen verkregen uit hout. Gesuggereerd wordt ook dat het land dat nu bedekt is met bos niet alleen beschouwd zou moeten worden vanuit een perspectief van industriële ontwikkeling, zoals voor de ontwikkeling van palmolieplantages, waarin de waarde van het bos zelf niet op de juiste waarde wordt gewaardeerd.

Deze monetaire waarde kan gebruikt worden door de beleidsmakers en overheidsinstanties bij de berekening van de compensatiebetalingen aan de lokale bevolking voor het verlies van het bos als gevolg van bosconversie of vanwege toewijzing van het bos aan houtkapmaatschappijen of voor oliepalmplantages. Deze waarde kan ook gebruikt worden als een voorlopige berekening voor de waardering van *externalities* indien de bossen worden geconverteerd of gebruikt voor andere landbouwkundige ontwikkelingsprogramma's.

Overheidsprogramma's die momenteel in het onderzoeksgebied worden uitgevoerd tonen aan dat het gebruik van planten en wilde dieren voor de inheemse bevolking van Paser als een onbelangrijk aspect van het bos wordt beschouwd. Dit blijkt onder andere uit de sterke mate waarin het bos de afgelopen tien jaar is omgezet in andere vormen van landgebruik zoals oliepalmplantages, houtplantages en mijnbouw, hetgeen zeer schadelijk is voor de bosbijproducten. Dit bleek op basis van het beleid waarbij de economische waarde van de bosbijproducten niet werden uitgedrukt in financiële termen bij de berekeningen van de overheid. Beleidsmakers waren zich eenvoudig niet bewust van deze waarde. Dit beïnvloedde de methoden van bosbeheer die bedoeld waren om de bosproducten te waarderen voor hun waarde voor de markt maar zonder hun rol en betekenis voor de economie van de inheemse bevolking hierbij te betrekken, wat uiteindelijk resulteerde in het niet-duurzame gebruik van het bos.

Er is geen twijfel dat uit het resultaat van deze studie blijkt dat het belang van bosbijproducten niet wordt onderkend in de overheidsprogramma's voor houtexploitatie en bosconversie ten behoeve van agrarische ontwikkeling. De economie van de mensen in de dorpen in het studiegebied zou veel slechter zijn als zij niet de beschikking hadden over het bos.

De economische waardering van de hulpbronnen in het bos zoals besproken in deze studie is bedoeld om de waarde van bosgebruik expliciet te maken, en niet noodzakelijkerwijs om de totale waarde van de natuur aan te geven. Zoals blijkt uit de literatuur is er veel belangstelling geweest voor het schatten van de totale economische waarde (TEV) van bossen. De discussie over economische waarde en de niet-economische dimensie van bos in deze studie, heeft de waarde van het bos en de monetaire waarde ervan vergroot, hoewel het nog ver verwijderd is van de totale economische waarde (TEV) hetgeen betekent dat het nodig is om een vervolgstudie te doen in het gebied van Gunung Lumut om die totale waarde voor de lokale mensen en het milieu vast te stellen. Verschillende waarden kunnen worden gegenereerd door verschillende technieken. De TEV van Gunung Lumut kan geschat worden als de som van de verschillende typen waarden.

Deze studie heeft het belang van de bosbijproducten als component van het tropische bos aangegeven en geanalyseerd. In aansluiting op een discussie over waarderingstechnieken die tegenwoordig gebruikt worden, is een poging ondernomen om de gebruikswaarde van deze producten in monetaire termen uit te drukken. Het is zonder meer duidelijk dat de waarde van een ecosysteem ver uitstijgt boven de directe gebruikswaarde ervan. Een identificatie van zulke gebruikswaarden in deze studie is de basis geweest door een schatting van de totale economische waarde van het bos van Gunung Lumut.

Het ecologische belang van bosbijproducten is nog steeds niet volledig duidelijk, maar verschillende aspecten ervan zijn in deze studie besproken naast een verslag van strategieën van bosbeheer. Een beschrijving van de hulpbronnen in het bos en hun rol binnen de context van het Paser district is hier gegeven. Op basis hiervan is een methodologie ontwikkeld waardoor de monetaire waarde van de bosbijproducten zoals gebruikt door de Paser bevolking kon worden geschat. Deze zou gebruikt moeten worden door de lokale overheid in de beschouwingen over het belang van bosbijproducten in het bosbeheer en ten behoeve van duurzame ontwikkeling.

About the Author

Bernaulus Saragih was born on July 1st, 1968 in Hutatinggir, Simalungun, North Sumatra, Indonesia and received his strata one degree (Ir.) in forest management from the Faculty of Forestry of the Mulawarman University in 1992. He subsequently worked for three years in a logging concession as a production manager, before he was appointed as a member of staff at the Forestry Faculty of the Mulawarman University,Samarinda, East Kalimantan, Indonesia in 1995.

He joined the GTZ-IGFP project as a junior advisor in 1995-1996, with the main task to analyse the production and distribution of logging concessions in East Kalimantan. He joined the FAO-RECOFTC training for forest products marketing in Bangkok, Thailand in 1996. Between August 1996 and July 1997 he joined the GTZ-SFMP (Sustainable forest management project) as a junior advisor for non-timber forest products marketing.

He obtained his Master's degree in Tropical Forestry in 1999 from the University of Gottingen, Germany, focusing on the importance of non-timber forest products in rural economies and tropical forest management. In the same year he returned to the Faculty of Forestry at Mulawarman University.

After finishing his Master's programme, he joined several research projects, including the EU-BFMP project for non-timber forest products and sustainable management of forest in Berau in 2000, the ITTO-Ministry of Forestry project for evaluating the role of traditional culture in forest management in 2002, and as an advisory member of the parliament of Bulungan District, East Kalimantan in 2002.

He is also a prominent contributor of articles on environment and forestry issues to the biggest newspaper in East Kalimantan, and in 2005 he was appointed as Editor-in-Chief of the Mulawarman University journal 'Natural and Life Sciences'.

His many years of experience working with non-timber forest products motivated him to undertake a guided PhD study in the field of valuation of non-timber forest products. This began with his involvement in the Trade-off Biodiversity Project of the Tropenbos Kalimantan Programme and the Centre for Environmental Science (CML), Leiden University and the Faculty of Forestry of Mulawarman University in 2003-2009.