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Economic valuation of natural resource management: a case study of the Benuaq Dayak tribe in Kalimantan, Indonesia

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ECONOMIC VALUATION OF NATURAL RESOURCE MANAGEMENT: A CASE STUDY OF THE BENUAQ DAYAK TRIBE IN KALIMANTAN, INDONESIA

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DEDICATION

To all of my family members, especially for my mom, Rosnah; my husband, Edward; and my son, Justin

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ABSTRACT

The unavailability of total economic values of indigenous people in Indonesia, both in the short and long term, has created the rejection of their existences in the forest area. The purpose of this study is to estimate the total economic value of sustainable forest management conducted by indigenous tribes in Indonesia using total economic value concepts. The tribe's total economic value is expressed by estimating the use value, indirect use value and non-use value. The study used benefit transfer and survey methods using questionnaires to estimate the tribe's total economic value.

The estimated total economic value of the Benuaq Dayak of U.S. $ 6,025.88 per hectare per year was calculated by summing the direct use value (U.S. $0.028 per hectare per year), indirect use value (U.S. $3,156 per hectare per year), and non-use value (U.S. $2,870 per hectare per year).

The research hypothesis that the Benuaq Dayak's sustainable resource management has economic value is supported. The research predicted that the estimated total economic value of the Benuaq Dayak's management might create a new perception of the tribe, the private companies, and the government.

PROBLEM STATEMENT AND JUSTIFICATION

Problem Statement

Indonesia's forests are among the most diverse and spectacular in the world. Currently, Indonesia's annual deforestation rate is as high as 1.5 million hectares, which has raised the concern of the entire international community (Wrangham, 2002). The deforestation is believed to results from a combination of increasing population pressure, poor land use practices, and national economic policy and development**.** The government suggested that forest loss results mainly from logging activities and forest clearance for other land-use purposes, such as agriculture, mining, resettlement, agricultural plantations and shifting cultivation (Meneg PPN/Bappenas 1993).

The forests areas conversion to other land-use purposes as the main cause of deforestation has always been sponsored by the government. This situation is further driven by the fact that the Indonesian Constitution of 1945, chapter 33, gives the government the right and responsibility to control its natural resources for the general good of the Indonesian people. Detailed authority is further described in the Basic Forestry Laws of 1967, which give the state a legal authority to plan and regulate all forest tenure and to use arrangements in its jurisdiction. One of its authorities allows the government to grant the right to extract timber from the forest areas to third parties (Wrangham, 2002). The centralized government drafted laws related to the forests for the whole of Indonesia without taking any account of the diversity of the Indonesian environment (Wrangham, 2002).

In order to achieve a higher rent from its forests, and to overcome its lack of economic investments, the government has granted the right to extract timber from the forest to the private timber Concession. Based on the Basic Forestry Law of 1967, the government is allowed to grant the right to private timber Concession to log vast areas of outer island forests with almost no regulatory oversight (Colfer and Resosudarmo, 2002). The government also grants the forest areas to the private plantation companies to convert the forest for agriculture purposes. Colfer and Resosudarmo (2002), explain that by 1997 some big islands in Indonesia such as Sumatera and Kalimantan, suffered a loss of forests to the plantation that worth of 2.3 million hectares.

The land use conversions of the forests have deprived forest dwellers called indigenous people of their rights and livelihood. The government has long identified indigenous people as destroyers of national forest resources and trespassers on state or concession land (Wrangham, 2002). Further, the Indonesian government perceives the shifting and pioneer agriculture done by the indigenous people as adversely affecting an extensive area of its forests. Indonesia loses 9,000 square kilometers of forest every year to shifting agriculture and only 1,000 square kilometers to logging (Mackinnon and Sumardja, 1996).

On the other hand, indigenous people are known for their traditional wisdom in their natural resource management. Some previous research has shown that indigenous people's management of natural resources is sustainable. Dove (1988), found in his research in Kalimantan that the tribal people could incorporate the swidden food crops and smallholder export crops in their forest area management to meet their daily need and consumer goods. This combination of subsistence and market-oriented agriculture has

proven to be extremely successful and shared important contributions to the national income. Peluso (1992) found that in making a living, indigenous people not only did slashed and burned, hunted, and harvested; but they also manipulated and managed animal population in ways often subtle and invisible to the scientist's and traveler's eye. Padoch and Peluso (1996) further found that indigenous people in Borneo, as resource managers have long been an inventive and diverse lot in how they manage and manipulate the landscape and biota. They have documented that the tribes have considerable variety and change in the economic activities of individual households, as well as far richer and more dynamic "agrodiversity" on the island as a whole. Thus, the indigenous people increase biodiversity, and provide diverse and continuous sources of income for themselves and the nation. Their management involves sustenance of forest products, socio-cultural traditions, and environmentally friendly practices. Padoch and Peluso (1996) found that the histories of the physical components of their forests are thus extricably linked with the changing technologies of indigenous people's population dynamic. The changing of social forces is affecting their decisions about how to use their forests as well (Padoch and Peluso, 1996). Unfortunately, indigenous people's management is difficult to quantify and hence not considered for comparison with the economic benefit of large timber Concession and plantation companies.

The fact that the involvement of private logging concessionaires and agricultural plantation companies has deprived the indigenous people of their rights and access to the forest is apparent. According to Colfer and Resosudarmo (2002), during the 1960s to 1980s, the government of Indonesia maintained the policy of complete rejection of local communities' forest access and its contempt toward forest dwellers' resource

management practices. Even though the government has begun to ease de jure restriction on local forest access and adopted a social forestry program in 1997, the local people's role has remained the same.

The government differing perceptions of indigenous people and private companies regarding their forest management is mainly because the government does not have accurate information of how much each stake holder's management is worth. The availability of the economic values of the forest concession companies and the agricultural plantation companies has given those companies the best access to Indonesian forest resources. The unavailability of total economic values of indigenous people, both in the short and long term, has created the rejection of their existences in the forest area. Therefore, it is important that the economic value of indigenous people's forest management be quantified. The understanding of every stake holder's economic value of their sustainable management hopefully may stimulate positive changes by the decision maker.

The need to quantify the total economic value of the indigenous people is very critical. My research is attempting to address this problem by trying to estimate the value of indigenous people's forest management using the total economic concepts. Three villages of the Benuaq Dayak tribe in West Kutai District, East Kalimantan Province, in Indonesia were chosen as the research areas.

Research Objectives

The research objective is to estimate the total economic value of sustainable forest management by an indigenous tribe in Indonesia using total economic values concepts. The case study is the Benuaq Dayak tribe on Kalimantan Island. The value estimation

results will determine if Benuaq Dayak sustainable forest management has value. The estimated total economic value will also hopefully support the Benuaq Dayak tribe's efforts to gain political support from local and central government for the their role and existence in regional development. The specific objectives of the research are as follows:

1. Identify and quantify the direct use value and indirect use value of the Benuaq Dayak's forest management.
2. Identify and analyze the Benuaq Dayak's perceptions of forest resources as a basis to calculate existence value.
3. Identify, analyze and estimate willingness to pay transportation costs and their willingness to reduce the natural resource consumption to calculate option value.
4. Calculate the total economic value estimation for Benuaq Dayak natural resource management

Dissertation Organization

Chapter One is the introductory part of the dissertation that explains the research background, problems and objectives. The introduction also explains stakeholder backgrounds and roles, both in Indonesian forest management and in economic development in the country.

Chapter Two gives a brief overview and objectives for the research. The detailed theoretical framework and justification are explained for all methodologies used in the research. Variables and tables are presented to describe the analysis process.

Chapter Three explains the process of how to estimate the direct use value for the Benuaq Dayak. The survey results, the calculation and the analyses to conclude the

direct value are explained in detail. Statistical calculations to test for homogeneity between villages are also discussed.

Chapter Four explains the present and the future perceptions of the Benuaq Dayak of their natural resources. The methodologies and justifications that are used in the calculation are explained in detail. The calculations of indirect use value and non-use value are used to express these values.

Chapter Five presents the total economic value for Benuaq Dayak resources management. The methodology and justification are presented regarding estimations and calculations to explain the total economic value for the Benuaq Dayak in the present and future. Various components of the Benuaq Dayak total economic value are compared to the analogous values for timber concession and agricultural plantation companies.

Chapter Six explains the rationale of the total economic value estimation to the Benuaq Dayak. The weaknesses and the strengths of the methodology and concepts that are used in the earlier chapters are discussed in detail. The implications of the total economic value to live and existence of the Benuaq Dayak are also evaluated in this chapter.

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A BRIEF DESCRIPTION OF INDONESIA AND KALIMANTAN

Geography

Indonesia is located in southeastern Asia, with Australia to the south and Malaysia and the Philippines to the north. As an archipelagic area between the Indian Ocean and the Pacific Ocean, Indonesia has some 13,677 islands and extends 5,000 km along the equator (Colfer and Resosudarmo, 2002). The geographic coordinates of Indonesia are between longitudes 95^{o} and 142^{o} east, latitudes 6^{o} North and 11^{o} South (MenPPN/Bappenas and USAID, 1993).

Indonesia's coastline spans 54,716 km with a total area of 1,919,440 km2 (Factbook, 2004). The climate of Indonesia is tropical with warm and humid conditions. The temperature ranges between 21^{o}C and 38^{o}C with a daily mean of 27^{o}C. The average humidity fluctuates between 72 per cent and 90 percent (Seeland and Schmithusen, 2002).

Indonesia's main natural resources are petroleum, tin, natural gas, nickel, timber, copper, fertile soils, coal, gold and silver (Factbook, 2004). Currently, Indonesia's environmental concerns are focused on deforestation, water pollution from industrial wastes, sewage, air pollution in urban areas, and smoke and haze from forest fires. Indonesia has participated in and has implemented some environmental international agreements covering biodiversity, climate change, desertification, endangered species, hazardous wastes, law of the sea, ozone layer protection, ship pollution, tropical timber 83, tropical timber 94, wetland signed, climate change-Kyoto Protocol, and marine life conservation (Factbook, 2004).

Kalimantan Island, the place that the research was implemented, is the second largest island in Indonesia after Papua Island. Kalimantan Island (Borneo) comprises of three separate nations: (1) The small area at the northern tip is Bruney Darussalam, (2) about half of the northern island area is Malaysia, and (3) the southern part of the island is Indonesia. Kalimantan is located between longitudes 108^{o} and 118^{o}, and latitudes 8^{o} north and 6^{o} south. In the Indonesian Kalimantan area, the major soil types are alluvial, ultisol, inseptisol and spondosol. The average daily temperature is 27^{o}C, and the humidity is between 72 percent and 98 percent (Seeland and Schmithusen, 2002).

Kalimantan Island is one of the important areas for timber and rattan productions. According to Padoch and Peluso (1996), Kalimantan Island has the bigest estimated standing stock of important timber among the five largets islands in Indonesia. In 1960, the estimated Kalimantan standing stock was about 2 million cubic meter or 54 percent of the national total estimate. In 1990, the standing stock estimate was 1.6 million cubic meters or 50.8 percent of the total national estimate. Kalimantan has also experienced at least three huge wild forest fires in the last 10 years that destroyed almost 6.5 million hectares of forest area.

People

Indonesia is the fourth largest populated country in the world with a total population of 208,452,952 and a population growth rate of 1.49 percent per year (Factbook, 2004). Life expectancy in Indonesia is 66.84 years for males and 71.8 years for females, with a productive age of 65.5 percent of its total population. Indonesia's current ethnic composition consists of 45 percent Javanese, 14 percent Sundanese, 7.5 percent Madurese, 7.5 percent coastal Malays, and 26 percent other (Factbook, 2004).

Indonesia's culture has a unique and complex tradition that has been influenced by Hinduism, Buddhism, Islam and Dutch over 300 years (Colfer and Resosudarmo, 2002). Indonesia has been characterized as having the most ethnically diverse population on earth, with each segment having its own language and culture. The official language that has united the communication among the people is a bahasa Indonesian (Colfer and Resosudarmo, 2002). About 87.9 percents of the population are literate (Factbook, 2004). Due to its centralized economy settings, Java and Bali islands became the most populated area in Indonesia. Almost 60 percent of Indonesia's population lives in Java and Bali, which cover only 7 percent of Indonesia's land mass (Colfer and Resosudarmo, 2002).

Politics

The Republic of Indonesia declared its independence on August 17, 1945. The country has a democratic constitutional government. Administratively, Indonesia is divided into 32 provinces with Jakarta as the capital city located on Java Island (Factbook, 2004; Colfer and Resosudarmo, 2002).

Indonesia has a centralized government. Jackson (1978), described centralized Indonesia as where power and participation in national policy decisions is almost entirely controlled by state actors at the central level, especially the bureaucracy part. The policies toward Indonesia's sectors included natural resources and forest area management and were developed in Jakarta and unified. The governmental bureaucratic systems were extended right down to the local level (Colfer and Resosudarmo, 2002).

Under Indonesia's second president, Soeharto, the extreme centralization was characterized by Indonesian politics and policies, and resulted in the abandoning of many

democratic principles. Over time, the situation stimulated the call for decentralization and the disgruntled citizens placed pressure on Soeharto. Soeharto resigned in 1998, and the decentralization of government authority accelerated (Colfer and Resosudarmo, 2002). Even though the decentralization brought reform to revenue sharing and decentralized many functions currently held by the central government to the regency level, the processes still brought some negative impacts. The natural resource exploitation is getting higher and corruption is more pronounced (Colfer and Resosudarmo, 2002). This is a result of the local governments using the decentralization process as an extension of their power.

Economy

Indonesia's economic development has suffered from recent acts of terrorism and unequal resource distribution among regions. This situation has continued Indonesia's reliance on international finance assistance. Indonesia accepted the support of International Monetary Funds (IMF) from 1998 to 2003. Currently, Indonesia accepts the bilateral economic aids from the Consultative Group on Indonesia, including the amount of U.S. $2.8 billion in grants and loans for the year 2004 (Factbook, 2004).

Indonesia is recognized as a major world center for biodiversity due to its wide range of natural habitat, rich plant and animal resources, and high numbers of island endemics. Indonesia's income is mostly supported by mining products such as oil, coal, gold and others. The forest products, agriculture, livestock and fishery are the third largest source of revenue after manufactured products such as textiles, chemicals and other manufacturing products (Bappenas and USAID, 1993).

According to the Factbook (2004), as of the year 2003, Indonesia's national GDP is U.S. $758.8 billion with the growth rate of 4.1 percent. Further, the GDP is earned mainly from industry (43.6 percent), services (39.9 percent) and agriculture (16.6 percent). The net income per capita is U.S. $3,200, and the population below the property line is 27 percent of its total population. Current unemployment rate is 8.7 percent and public debt is almost 72.9 percent of its GDP. Indonesia's currency is rupiah, and its exchange value to the dollar is about 9,000 rupiah.

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CHAPTER 1
NATURAL RESOURCE MANAGEMENT IN INDONESIA

1.1 Introduction

Indonesia has the second largest tropical forest in the world after Brazil. The tropical forest covers two-thirds of the country's land area and is considered the most valuable resource. Officially, the total area of forest in Indonesia is 120 million hectares (Riyadi, 2004), but only 76.7 million hectares of natural forest area remains (Kartodihardjo, 2002). Further Kartodihardjo (2002) explained that out of 76.7 million hectares, only 36.5 million hectares are primary or virgin forests and the remaining areas are secondary forests, degraded forests or even un-forested area.

Indonesia's deforestation rate is extremely high. With the annual deforestation rate at 1.5 million hectares, Indonesian forest conditions have raised concern in the international community (Wrangham, 2002). The main cause of deforestation is believed to result from the combination of increasing population pressure, poor land use practices, and national economic policy and development (Meneg PPN/Bappenas, 1993). Indonesia's Forestry Department believes that the forest losses mainly result from logging activities and forest clearance for other land use purposes, such as agriculture, mining, resettlement, plantation and shifting cultivation by local people, called indigenous (Wrangham, 2002). Unfortunately, for many decades the government blamed the forest loss more on shifting cultivations by indigenous people (Meneg PPN/Bappenas, 1993). Mackinnon and Sumardja (1996) reported that the government planners and forest managers have blamed shifting agriculture for much of Indonesia's forest losses.

They stated that Indonesia loses 9,000 square kilometers of forest every year to shifting agriculture and only 1,000 square kilometers to logging.

Due to the lack of its financial ability, the government involves large timber concessions in extracting timber from the forest. It also grants the forest areas to the plantation companies to convert the forest for agriculture purposes. Unfortunately, due to reasons such as the unsustainable practices of logging, lack of government law enforcement and the growing demand for timber both nationally and internationally, the timber extraction has been over-harvested for the last ten years and created environmental problems. Between 1994 and 1996, log production had been over about 10 percent of Indonesia's natural forests' natural capacity (Resosudarmo, 2002). Forest harvesting through Indonesia's selective cutting and planting system had negative repercussions on up to 48 percent of the remaining trees (Resosudarmo, 2002). The reforestation implementation program nationally only reached 40 percent of the original target, and the log-over areas that had been replanted only totaled 4 percent (Colfer and Resosudarmo, 2002). The soil compaction related to the logging operation in Kalimantan reduced the water infiltration up to 21 times, resulting in a high erosion rate and flooding (Colfer and Resosudarmo, 2002). In many places agricultural plantations have coverted diverse habitat into monoculture habitats. The forest area clearance for agricultural plantations has reduced the biodiversity richness and caused the local wildlife habitat loss.

The involvement of private logging concessionaire and agricultural plantation companies has deprived the indigenous people of their rights and access to the forest. The government has not recognized the indigenous existence in the forest areas yet. Most of Indonesia's forest-related laws are in conflict with the customary law of

traditional communities and more privileges are given to commercial timber extraction (Wrangham, 2002). Colfer and Resosudarmo (2002) found that in during the 1960s to 1980s, the government of Indonesia developed the policy of complete rejection of local communities' forest access and of contempt toward forest dwellers' resource management practices.

The lack of recognition by the government of the indigenous existence in the Indonesian forest areas is mostly driven by the government's desire to seek higher forest rents and to maintain the international performance of conservation management. The lack of information about indigenous people's local traditions and their economic importance to the local forest system has made the situation even worse. The need to know the importance of the role of the indigenous people's existence to the forest areas is critical. An estimate of the economic worth of their management to the environment and national or local economic development needs to be done. Does the indigenous people's land management have to be sacrificed in order to gain a higher economic value for the timber concessions and agricultural plantation? These problems need to be resolved properly.

The research of economic valuation for forest resource management activities of the indigenous people is intended to help solve the problems above. The estimate of these peoples management's total economic value is implemented in order to help the tribe's role in their areas. The research here is focused on the Benuaq Dayak tribe in East Kalimantan as a representation of indigenous people in Indonesia. The research is also used the secondary data of total economic value of timber concession and agricultural plantation company in the area that have already existed for comparison.

1.1.1 Forest Classification

Most of the forests in Indonesia are designated as state forests and managed by the government. As mentioned above**,** the Indonesian government has the right and responsibility to control its natural resources for the general good of the Indonesian people. They also have the authority to plan and regulate all forest tenure and to use arrangement in its jurisdiction.

The authority to manage the forest areas has resulted in the division of forest area functions based on consensus (TGHK). The consensus is made among the government institutions that have a relation to the forest areas or its management, such as the Forestry Department, Transmigration and Resettlement Department, Agriculture Department, local government, and so on. The forest classifications based on consensus are named production forests, protection forests, and conservation forests.

1.1.1.1 Production Forest

These forest areas are set aside mainly for timber production, and managed by private logging concessions and state-delivered concessions. Some limited types of non-timber production are also harvested in this area. Production forest is divided into three specific functions: (1) regular production forest that can produce timber optimally; (2) limited production forest that can only harvest the timber at a certain amount due to its environmental and social considerations; and (3) production forest that is available to be converted to other land uses. This area is set aside specifically based on its environmental and location considerations in order to be converted to other land uses in the future.

1.1.1.2 Protected Forests

This is the forest area that is managed by the government. The area is specifically assigned to protect the unique wildlife and local habitat. This area is usually assigned for the endangered species of animals or plants and their habitat.

1.1.1.3 Conservation Forest

This is the area managed by the government that is more flexible than protection forest. The conservation forest can mix the function with the local development at its boundary or in a special assigned area. The local development involves things such as tourism, broad scale research and community development. National park areas are one of the classifications.

Unfortunately, Dermawan and Resosudarmo (2002) reported that much of the classification was made on an ad hoc basis. Not only without due consideration to ecological functions of the forest but also with little regard to the social, cultural, and economic functions of the community. As a result, most of the forest area classification borders often create friction between the government, private companies and indigenous people. The division of the forest areas is based on the consensus forest functions presented in table 1.1.

Table 1.1 Current Forest Classifications in Indonesia

FOREST FUNCTION	TOTAL (Million Hectares)
Production forest	41.2
Protection Forest	12.5
Conservation forest	17.4
Total forest area	76.7

Source: Kartodihardjo (2002).

1.1.2 Sustainable Forest Management

Sustainable forest management manages the forest yields and functions to meet the needs of the present without compromising the ability of future generations to meet their needs (Bruntland, GH, 2000). In Indonesia, sustainable forest management has been interpreted as a strategy and implementation of activities in producing forest products. In addition to forest utilization, the management strategy should also ensure the continuity of forest productivity, ecological/environmental functions and social functions (BSN, 1998). Furthermore, this should be implemented harmoniously and enhance both the current and future potential to meet human needs and aspirations (NRM-USAID, 2000).

According to the results from cooperative research projects conducted by the Indonesian Ministry of Forestry and German Development Cooperation Agency (1998), sustainable forest management is supported by:

1. Not harvesting timber beyond actual grow rates;
2. Applying reduced impact logging (RIL) standards;
3. Implementing stand specific silviculture;
4. Rehabilitating degraded forests;
5. Maintaining biodiversity;
6. Preventing forest fire;
7. Strengthening forest management institution;
8. Meeting social standards of green certification; and
9. Reducing illegal logging.

In fact, when it comes to forest rent, the government of Indonesia still perceives the forests as timber production machines. Since 1967, when the government granted the private timber concessions the right to manage the forests, up to the 1990s, about 612 million cubic meters of round wood was extracted (Barr, 2002). Further, the sustainable forest management issue is addressed only on how to reform and regulate timber logging and its industrial processes. Barr (2002) reported that since the 1980s, policies toward promoting sustainable forest management in Indonesia have focused exclusively on reforming the timber concessions system. Barr also stated that the government has been ineffective in implementing the reformation. He suggested three major policies that the government needs to strengthen in order to enforce sustainable forest management at the timber concession: (1) the government should be able to increase its capacity to enforce the technical aspects of sustainable concession management among the timber concessions; (2) increase the timber royalties and fees to halt the flow of resource rents (revenue above the normal); and (3) lift the ban on log trading in order to avoid internal log trading among the concession and the industry inside Indonesia with the price well below the market price.

Sustainable forest management for the government is not only meant to produce the timber in sustainable ways. The forest protection and conservation of wildlife and their habitat is part of the sustainable management as well. The government believes that forest classification areas based on its function are part of the sustainable forest management. Up to the year 2000, the government has stipulated 386 units of conservation areas covering 22.49 million hectares on forestland, open seas corals and

mangrove areas. These 386 units included a national park and protection forests open seas national parks (Riyadi, 2004).

The indigenous people's sustainable forest management expresses when they can maintain the range of their practices over landscaping and time. The shifting cultivation areas are developed for two or three years following the forest areas opening. The shifting cultivation is followed by planting some fruits, saps and timber trees that are called fruit gardens (Kebotn and Simpukng) and/or forest area (Bengkar). These practices mean that the tribe utilizes the forest as their land bank as a means of restoring soil fertility after cropping. The forest or fruit garden development by the Benuaq Dayak could be seen as biodiversity enrichment of the area. Hunting wild game and collecting a range of forest products results in additional food and income as well. The tourism activities and handicraft creations give them an additional cash income. In short, sustainable forest management by the Benuaq Dayak is a way to maintain and provide biodiversity increment, and also diverse and continuous sources of income for themselves and the nation.

1.1.3 Forest Stakeholders

As it has been mentioned, the government is the main stakeholder in the forest resource management issues in Indonesia. The National Basic Constitution of 1945 and the Basic Forestry Law of 1967 gave the government the right to determine who gains access to the forest and who does not.

The private companies, as the lengthened hands of the government to manage the forests have played an important role in sustainable forest management. Even though the government has been trying to regulate the sustainable forest management on timber

concession activities, the deforestation rate is still high. The secondary information of two timber concession companies in Kalimantan, implemented by the department of forestry at Bogor Agriculture University, founded in 2000, was used in the research. These timber concession companies are HPH PT Mountrado Jaya and HPH PT Bintang Arut. These companies represent stakeholders as private companies.

Other private companies that are considered stakeholders are the agricultural plantations. The plantation is one of the most preferred in the forest areas land use conversion after timber concessions. The research was taken from one of the palm oil plantations in West Kalimantan and based on Mangunsong dissertation information (2000).

Local people that are called indigenous people are considered stakeholders as well. Currently, approximately three million people live inside and adjacent to forest areas and depend on forest products for a substantial proportion of their livelihood (Meneg PPN, 1993). The research used the Benuaq Dayak tribes that live in the East Kalimantan forests as representatives of indigenous people. This tribe was taken as a representative because of their high dependency on the forest areas and its unique traditional cultures that affect its management of the forest areas.

1.2 The Benuaq Dayak Tribe

1.2.1 Ethnicity

The Dayak tribes are usually differentiated based on how close their area is situated to the river. The groups are defined by whether the tribes live above the river or at river level. The Benuaq are a subgroup of the Luangan who belong to the Barito river language family and hold Hindu Kaharingan as their religion. The Hindu Kaharingan

religion practices secondary mortuary rites and shamanism curing rituals (Seeland and Schmithusen, 2002).

1.2.2 Social Stratification and Status

The Benuaq tribe is stratified based on social differences and marriage status. According to Seeland and Schmithusen (2002), the traditional highest stratum that refers to community leaders and their families is called Mantiiq and the intermediate stratum is called Merentika. Currently, the traditional strata that Seeland and Schmithusen described are difficult to be found in the tribe. Officially, the highest leader in the village is the village head, voted on by the village people and assigned officially by the government. The village leader is mainly responsible for economic and official activities at the village level. The traditional events of the village people and the official activities related to the traditional and cultural events are usually arranged by the head of adat (personal observations).

Currently, the traditional stratum membership such as head of adat, mantiiq and merentika play less important roles and gain less status respect in daily life (Seeland and Schmithusen, 2002). According to their research, status is earned more from wealth and purely economic status symbols such as TV sets, chainsaws, boats, and motorbikes. The village people are more respectful toward blacksmiths, shamans, successful hunters and war heroes (Seeland and Schmithusen, 2002).

A family or household in the Benuaq Dayak tribe is generally composed of a married couple and their children (personal observations; Seeland and Schmithusent, 2000). Since most of the Benuaq Dayak tribe people live in the long house that could consist of several households, the family can be extended to three generations.

According to Seeland and Schmithusen (2002), shared food is common in the long house, but the income is mainly managed by the nuclear family or household.

1.2.3 Traditional Adat Law and Land Tenure

The traditional adat law regulates most of the social aspects at the Benuaq Dayak tribe. The adat law is referred as "the indigenous normative system of Indonesian societies and communities" which varies within the Indonesian archipelago (Loffler, 1996). Traditional adat is unwritten law that is handed down through generations and supervised by the head of adat in the village. Cases of violations against adat are discussed in village meetings and punishment, such as financial fines and ritual payments, are decided by a consensus (Seeland and Schmithusen, 2002).

Land tenure is regulated under the adat law as well. In the Benuaq Dayak tribe, the land tenure that is applied is a devolvable usufruct system. This system refers to a permanent right derived from the first clearing of primary forests (Appell, 1986). The permanent usufruct can be acquired by the clearing of primary forest and this right can be transferred to other legal parties, both individuals and groups of people (Seeland and Schmithusen, 2002).

1.2.4 Description of Resource Use

The Benuaq Dayak in general has an extensively cultivated, rain fed agriculture system, supported by semi-wild inventories of plants from the surrounding forest areas (NRMP-USAID, 2000). The households maintain livestock as their meat and income source, along with the animals and plants that are collected from the forest areas. The dependency of the tribes on the natural resources, including the forest area, has formed the special land use patterns. Besides providing the basic needs for food and housing, the

different land uses will also provide increasing varieties of income in the long run (personal observation). Seeland and Schmithusen (2002) reported that the Benuaq Dayak has combined the swidden agriculture and the use of extracted and cultivated forest products as their basis for livelihood, which proves their understanding of resources.

The land use of the Benuaq Dayak is basically a constant changing state of the forest areas into swiddens cultivations, then into forest gardens, and then finally letting natural succession turn the areas into forest again (Seeland and Schmithusen, 2002), In general, there are five different land uses known to be used by the Benuaq Dayak: *Umaq, Simpukng, Uratn, Kebotn/Dukuh,* and *Bengkar.*

1.2.4.1 Umaq (Paddy and Annual Crop Field)

The Dayak Benuaq's primary activities are mainly at the Umaq. The Umaq is an extensively cultivated, rain fed agriculture system that is planted with semi-wild inventories of plants from the forest and surrounding areas. The Umaq is the first source of staple food for the tribes, with items such as paddy and sticky rice, maize, cassava, various vegetables and sometimes fruits and fuel woods. The planting system has a typical cropping cycle of one year. The Umaq is usually cultivated for two to three years, and then fallowed for about 5 years as an Uratn area.

1.2.4.2 Uratn or Uraaq (Fallowed Field)

Uratn is usually the area that used to be an Umaq area. This area is cultivated at the end of the Umaq phase. The plants consist of certain fruit and timber trees and also wild pioneer trees that are useful for fuel woods. After its fallow time, Uratn area will become a Simpukng, Kebotn, or Bengkar area.

1.2.4.3 Kebotn (Fruit Garden around the House)

Kebotn is the garden area located around the house planted with fruits, simple vegetables and medicinal plants. This area to a certain extent plays an important role as the source of food and additional income for the household. It produces fruits and vegetables that can be sold at the local market.

1.2.4.4 Simpukng (Agro-forestry Field)

The Simpukng is the area that already has five or more year old plants or trees. It has many different fruit trees and other economically worthy tree species such as rubber, pines, rattans and also timber. The Simpukng is owned by an extended family in a long house consisting of at least five to ten nuclear families. The access to the Simpukng area is not limited to the owner only, but is open for the people who come from out side the village. They may take as many of the fruits as they need without permission as long as they do not sell them. This area is designed for public services with certain limitations applied. At the present time, the charity function has diminished because people tend to take more than they need in order to sell the fruits. However, people from other villages still have access to the fruits with certain permission from the owner.

1.2.4.5 Bengkar (Reserved Forest Area)

The Bengkar is the area that is usually called forest. The Bengkar is owned by the village and generally managed by the village boards. The village board consists of a village leader, village administrators and the customary leader (ketua adat). The Bengkar is the main source of building materials (e.g., timber, bamboo, rattan), medicinal and ritual plants, wild vegetables, and hunted animals (e.g., wild pigs, birds, deer) for the village members.

The Benuaq Dayak keeps an open-mind regarding new technologies. Some studies that were conducted at the Dayak's tribe areas have shown that the Benuak Dayak has adopted new technology from outside their villages. Michael Dove (1993) has shown that the Dayak tribes have shifted their natural local rubber species to *Hevea braziliensis* species, which has given their neighboring village better rubber sap productivity.

1.3 Agricultural Plantations

Agricultural plantation production and exports in Indonesia are dominated by oil palm and rubber. The area of oil palm had increased 24 times in 30 years, from 105,000 hectares in 1965 to 2,630,000 hectares in 1998 and the rubber plantation area reached 3.5 million hectares in 1998 (Resosudarmo, 2002). The rubber products exports in 1998 were worth up to U.S. $1.1 million and oil palm products exports were worth U.S. $1.4 billion (Casson, 2004). The agricultural plantations in Indonesia are usually created on land that has been converted from tropical forests. Casson (2002) explained that the expansion of oil palm plantations has raised concern because much of it has occurred at the expense of Indonesia's humid tropical forest.

PT SMP is one of the agricultural plantation companies in the East Kalimantan area. This company's total economic value will be presented as an example of the agricultural plantations' past total economic value. The data is taken from the research done by Farma Mangunsong and included in her dissertation at the University of Indonesia in 2000. Mangunsong (2000) reported that PT SMP oil palm plantation covers 20.000 hectares and is located in East Kalimantan. The company was granted the right to manage the area for 28 years. The company has its own factory to process the oil palm fresh fruits into crude palm oil (CPO) and kernel palm oil (KPO). The average production

of its fresh fruit is about 25 ton/hectares annually. The projected company's net profit for 28 years is 43,250.50. The net profit per year per hectare on average is U.S. $1,544.66. When the company's profits are analyzed for the 28-year period with 15 percent interest, the estimated net present value (NPV) of the company is U.S. $5,191.7/ha/28 years or U.S. $185.42/ha/year. If the estimation included the externalities and internalized the indirect values, the NPV would be U.S. $5,795.00/ha/28 years or U.S. $206.96/ha/year (Mangunsong, 2000). Table 1.2 shows PT SMP's direct use value, indirect use value and total economic value. The table is cited from Mangunsong (2000).

Table 1.2 Oil Palm Plantation Economic Value

Economic Value's Components	Values (U.S. $ 1,000)
Direct Use Values	409,630
Indirect Use Values	(301,960)
Non Use Values	(393,803.9)
Total Economic Values	(286,134)
NPV (15%)	(206.96)

1.4 Forest Concessions

Logging concession companies in Indonesia have played the most important role in Indonesian economic development. Up to the year 1991, the wood products that were mainly log exports were the second biggest income after oil and natural liquidified gas exports (Resosudarmo, 2002). In 1997, timber production included timber industrial products such as plywood and pulp and paper, which contributed almost U.S. $7 billion worth of foreign exchange to the Indonesian economy (Bank Indonesia, 2000; The World Bank, 1996). Up to the year 1999, the government allocated a total of 585 logging concessionaire areas (HPH), totaling 62 million hectares to the private and state owned

companies (Barr, 2002). Despite its economic fortune, the logging concessionaire has created environmental and social problems for Indonesia. Due to unsustainable practices, lack of the government's control and the growing demand both nationally and internationally, the timber extraction has been over-harvested for the last ten years. Between 1994 and 1996, the log production was over about 10 percent of Indonesia's natural forests natural capacity (Resosudarmo, 2002). The deforestation rate had skyrocketed and reforestation progress was poorly implemented. Forest harvesting through Indonesia, selective cutting and planting systems had a negative impact on up to 48 percent of the remaining trees (Resosudarmo, 2002). The reforestation implementation program nationally only reached 40 percent of the original target, and the log-over areas that have been replanted only reached 4 percent (Colfer and Resosudarmo, 2002). The soil compaction related to the logging operation in Kalimantan had reduced the water infiltration up to 21 times and resulted in high erosion rates and flooding (Colfer and Resosudarmo, 2002).

PT Mountrando Jaya and PT Bintang Arut are two of the private timber concession companies located in the Central Kalimantan province. The average of their total economic values will be presented as an example of total economic value for the timber concessionaire in East Kalimantan. The data is taken from the research done by the forestry department at Bogor Agriculture University. The research was intended to create the appropriate method for a forest valuation system in Indonesia. The research has calculated the direct use value, indirect use value and non-use value of PT Mountrando and PT Bintang Arut and then averaged them in order to estimate the total economic value.

PT Mountrando Jaya covers 81,342 million hectares. Annual logging production is 552,018 cubic meters. PT Bintang Arut covers 69,000 hectares. Annual potential logging production is predicted at 2,859.3 cubic meters. The estimated total economic value for PT Mountrando and PT Bintang Arut on average is 79,770 million rupiah (U.S. $8.863 million). This total economic value is the estimation for Kalimantan's timber concessionaire total economic value (Fakultas Kehutanan IPB, 1999). Table 1.3 shows the detailed economic value of the timber concessionaire's total economic value in Kalimantan. The table is cited from Fakultas Kehutanan IPB (1999).

Table 1.3 Economic Value for Timber Concession in Kalimantan (U.S. $)

Direct Use Value	377.16
Indirect Use Value	5,768.85
Non-Use Value: - Option Value	0.37
- Existence Value	8,175.97
Total Economic Value	14,322.34

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CHAPTER 2
THEORETICAL FRAMEWORK AND METHODOLOGY TO MEASURE ECONOMIC VALUATION FOR BENUAQ DAYAK FOREST MANAGEMENT

2.1 Introduction

Indigenous peoples have lived in the forests of Indonesia for thousands of years and generally have not changed their forest system management methods. Conversely, private companies have dramatically changed forest systems through conversion of forest to other land uses and over-harvesting relative to regeneration.

The government of Indonesia has created unfair competition among forest rent seekers. Since private timber concession and agricultural plantation companies provide higher economic rents to the government than indigenous people, they have gained access and privilege to use Indonesian forest resources (Resosudarmo, 2002). On the other hand, indigenous people such as the Benuaq Dayak tribe that live in the forests and surrounding areas have been deprived of these rights in contrast to the private companies (Wrangham, 2002).

According to Colfer and Resosudarmo (2002), between the 1960s and 1980s, the government of Indonesia developed policies that resulted in severely limited local community forest access and suggested contempt toward forest dwellers' resource management practices. In regulation of SK 251/1993, the Ministry of Forestry identified forest communities as a potential threat to timber companies, resulting in the government loosening protection of their rights to harvest non-timber forest products and timber for consumptive use. Although the government has begun to ease de jure restriction on local forest access and adopted a social forestry program in 1997, the local people's role in

forest management and their lack of voice in policy decision making has largely remained unchanged.

Forest management results in more than private sector economic value. Unfortunately, current valuation systems in Indonesia do not reflect non-private sector forest values and typically discount natural resource direct use management values (Furst, Barton, and Jumenez, 2000). One reason for this is the lack of the ability to value resource management conducted by indigenous people. Their subsequent marginalization has resulted in stakeholder friction between indigenous people, private companies and the government. Therefore, a method to analyze the values contributed by indigenous people is critical to developing forest resource valuations that are equitable for all stakeholders.

Incomplete information on indigenous people's forest management contribution to economic value has positioned indigenous people as a non-contributing economic agent in Indonesia's national economic development. The government regards indigenous people as nomadic, forest-dwelling hunters and gatherers, possessing primitive, subsistence-oriented economies (Hoffman, 1990). Further, Dove (1990) suggests that the government of Indonesia does not believe that indigenous people can even satisfy their own economic needs.

Currently, indigenous people's management values are limited only from their daily direct uses of forest products. As Dove (1988) explains, tribes have used swidden food crops production methods in forest management to meet their daily needs and to generate export income. The literature is sparse on providing information on other economic value generating activities from indigenous people forest management. Values currently not reflected include direct use value, indirect use value and non-use value.

Further, although tangible, or direct use value, such as timber and non-timber products, can be estimated by market prices, it fails to reflect real value due to the existence of externalities. Hanemann (1994) reported that markets often fail to generate accurate prices because of the non-excludable or non-rival nature of other costs and benefits. He suggests that the willingness to pay by individuals to avoid damages or accept benefits are values that can be aggregated into a total price.

Intangible values consist of indirect use value and non-use value resulting from forest functions and include hydrology and water resource management, carbon sequestration, environmental contributions, habitat systems for wildlife, maintaining biodiversity, etc. Theoretically, indirect values can be estimated by substitute products, replacement costs or preventive expenditures. Non-use values can be estimated by travel cost value, hedonic value or contingent valuation methods (McCracken and Abaza, 2000). As a result, in addition to timber extraction and land conversion to agriculture, indigenous people's traditional forest management contributed to economic value as well. Total economic value needs to include intrinsic, ecological, economic, cultural and aesthetic values. Finally, total economic value contributions by indigenous people might actually be more competitive and sustainable in comparison to timber concessions and agricultural plantations in the long run.

2.2 Valuing Forest Management

Forest resources have long been known to have intrinsic, ecological, economic, cultural and aesthetic values (Furst et al, 2000). Sustainable forest management results in efforts to maintain forest values and functions. Holland (2000) suggests that sustainability is a requirement to keep natural resources generated capital intact over time.

Market transactions often provide an incomplete picture of true values. For example, Meldeva (2000) reported that a current method of forest valuation in Russia is based solely on timber valuation. Furst et al. (2000) suggest that most cases of market failure happen because of immediate economic benefit considerations such as demand for timber, demand for agricultural land, or the need to export forest products to generate foreign exchange.

Total economic valuation concepts are commonly used to reflect intangible good values. In one example, Pearce et al. (1993) applied a number of techniques for estimating the total economic value of forest in Mexico. Turner and Jones (1991) break down total value into direct use values, indirect use values and non-use values. Oglethorpe and Miliadou (2000) explain that direct use values are the benefits provided by natural resources that are of direct use to people as the generation of marketable goods that can be traded. Examples of direct use values are timber products, non-timber products, fishing, hunting, and tourism. Further, Oglethorpe and Miliadou (2000) state that indirect use values are functional services that natural resources provide and are reflected in indirect benefits. Examples of indirect use values are carbon storage, flood prevention, and watershed protection (Furst et al. 2000). Non-use values are non-market intangible values, which people derive from preservation of environmental assets (Stevens et al. 1995). McCracken and Abaza (2000) refer to non-use values as passive use values characterized as intangible and per se are not observable from revealed preferences. They are quantifiable through direct pooling of use values and contingent valuation.

Current methods used for natural resource valuation have a wide range of applications and depend on the issues to be addressed, data availability, credibility and cost considerations (McCracken and Abaza 2000). Generally, valuations are based on cost and benefit analysis (CBA). Additional methods used in economic valuation are market prices, replacement cost and preventive expenditure, proxy/substitute products, opportunity cost, travel cost, hedonic pricing, and contingent valuation (McCracken and Abaza 2000).

2.3 Research Setting

The Benuaq Dayak is one of the indigenous tribes in Indonesia. This tribe is known for its sustainable way of managing natural resources. This research estimates the economic value of the Benuaq Dayak management practices. It was conducted at three different villages: Tepulang, Benung, and Dingin located in the Kutai Barat District, East Kalimantan Province, Indonesia.

The Tepulang and the Benung Villages are located inside the Idaatn watershed of the upper Mahakam River. The Dingin Village is located in the Kedang Pahu watershed. The research area can only be reach by speedboat with a traveling time of about 7 hours from the provincial capital of Samarinda. These three villages were selected as the research areas because they have maintained 100 percent Benuaq Dayak ethnicity and are still using traditional customs in managing their natural resources.

The Benuaq Dayak way to manage natural resources is believed to be sustainable. Research has shown that the Dayak tribe has maintained management practices that can give them a variety and continuity of income. These activities include shifting cultivation, hunting and collection of various forest products, small-scale handicraft

productions and tourism activities (NRMP-USAID, 1996). Dove (1988) found in his research in Kalimantan that the tribal people could incorporate the swidden food crops and smallholder export crops in their forest area management to meet their daily need and consumer goods. The combination of subsistence and market-oriented agriculture has proven as successful and has shared important contributions to the national income. Padoch (1992) found that the tribe not only slashed and burned, hunted, and harvested; but they also manipulated and managed animal populations in ways often subtle and invisible to the scientist's and traveler's eye. Padoch and Peluso (1993) explained that the tribes have considerable variety and change in the economic activities of individual households, as well as far richer and more dynamic "agrodiversity" on the island as a whole. Thus, the tribe increases biodiversity and provides diverse and continuous sources of income for themselves and the nation. Their management involves sustenance of forest products, socio-cultural traditions, and environmentally friendly practices. In short, Benuaq Dayak management is sustainable forest management because it maintains biodiversity and also continuous sources of income.

Unfortunately, the Benuaq Dayak way of management is difficult to measure in terms of economic value. The need to calculate this economic value is critical for the Benuaq Dayak's existence as it will help them to gain the respect of the government and other stakeholders related to natural resources management. This, in turn, will hopefully lead to changes in policy that will allow continuation of the Dayak way of life.

2.4 Research Objectives

The overall research objective of this research is to estimate total economic value resulting from sustainable forest management conducted by indigenous tribes in Indonesia using total economic values concepts. This value estimation can help discern Benuaq Dayak sustainable forest management economic value and make comparisons to existing economic value generated from timber concessionaire and plantation companies. The estimated Total Economic Value may support the Benuaq Dayak tribe's efforts to gain political support from local and central governments to their role and existence in regional development. The specific objectives of the research are to:

1) Identify and quantify the direct use value and indirect use value of Benuaq Dayak forest management.
2) Identify and analyze the Benuaq Dayak's perceptions of the forest resource as a basis to calculate the existence value.
3) Identify, analyze and estimate the willingness-to-pay transportation costs and the willingness to reduce natural resource consumption as a way to calculate option values.
4) Estimate the total economic value for Benuaq Dayak natural resource management methods.

2.5 Theoretical Framework for Total Economic Valuation

Total economic value incorporates actual use values plus non-use values that express the range of social economic values associated with society's use and enjoyment of the natural world. Total economic value consists of direct use values and indirect use

values. Non-use value includes existence value, option value, bequest value, altruistic value, and the value of ecological services (McCracken and Abaza 2000).

McCracken and Abaza (2000) further explain that direct use values are estimated by methods that elicit preferences by either conducting experiments or by using questionnaire-based surveys, usually using local market prices. Indirect use values and non-use values are valuations that estimate non-marketable good value. Indirect use values are estimated by eliciting preferences and observed market-based information.

Kahn (1998) suggests that two techniques can be used for measuring the value of non-market goods: 1) revealed preference approaches that can be implemented by using hedonic pricing, hedonic wage, and travel cost models; and 2) stated preference techniques that can be implemented by using contingent valuation and replacement cost models. Pearce et al. (1993) used a number of techniques such as damage costs, mitigation cost, lost production avoided, contingent valuation and the travel cost methods for estimating the total economic value of forests in Mexico.

This research combines different techniques in order to calculate total economic values for Benuaq Dayak tribal forest management. A survey-based approach was applied to estimate direct use values. Benuaq Dayak management productivity was collected on timeframe-specific bases (daily, weekly, monthly and yearly). Local market prices were used to estimate economic productivity values. Local expenses such as transportation, health and other traditional activities were estimated counted and deducted from annual productivity values to arrive at net direct use values.

Indirect use values and non-use values were estimated using a survey-based approach employing contingent valuation, travel cost, and replacement cost techniques.

The contingent valuation model (CVM) is a direct valuation method which involves asking respondents what they would be willing to pay for a benefit, and/or what they are willing to receive by way of compensation to tolerate the cost. The objective of CVM in this setting elicits personal valuations of increases or decreases in the quantity of some environmental good (McCracken and Abaza 2000). CVM was used to reveal the willingness of the Benuaq Dayak to sacrifice current forest product consumption in order to conserve the forest for their future generations.

The data collected was used to express the Benuaq Dayak bequest values and existence values. CVM was used to estimate the bequest value component of non-use value because it has been used successfully to value economic benefits of wetlands for both use and non-use values (Stevens et al. 1995). Further, Bateman and Turner (1993) reported that CVM has potential for application to a wider range of environmental goods than any of the other monetary valuation techniques.

The travel cost technique (TCT) is an indirect valuation method which uses observed expenditures on the travel to recreational sites to estimate the benefit resulting from the money and time spent by people in getting to a site and to estimate their willingness to pay for the site's facilities or characteristics (McCracken and Abaza 2000). TCT was applied to estimate the willingness to pay for transportation costs among the Benuaq Dayak in order to conserve their forests. This data was used to estimate option values of the Benuaq Dayak.

The replacement cost technique (RCT) is an indirect valuation technique which examines the cost of replacing or restoring a damaged asset to its original state, and uses this as a measure of the benefit of restoration (McCracken and Abaza 2000). The RCT

was used to identify Benuaq Dayak forest management preferences relative to agricultural plantation or timber concession land uses. Figure 2.1 shows the different components that lead to total valuation. Each model component is discussed in subsequent sections. The table is cited from Forestry Department of Bogor Agriculture University with modifications (1999)

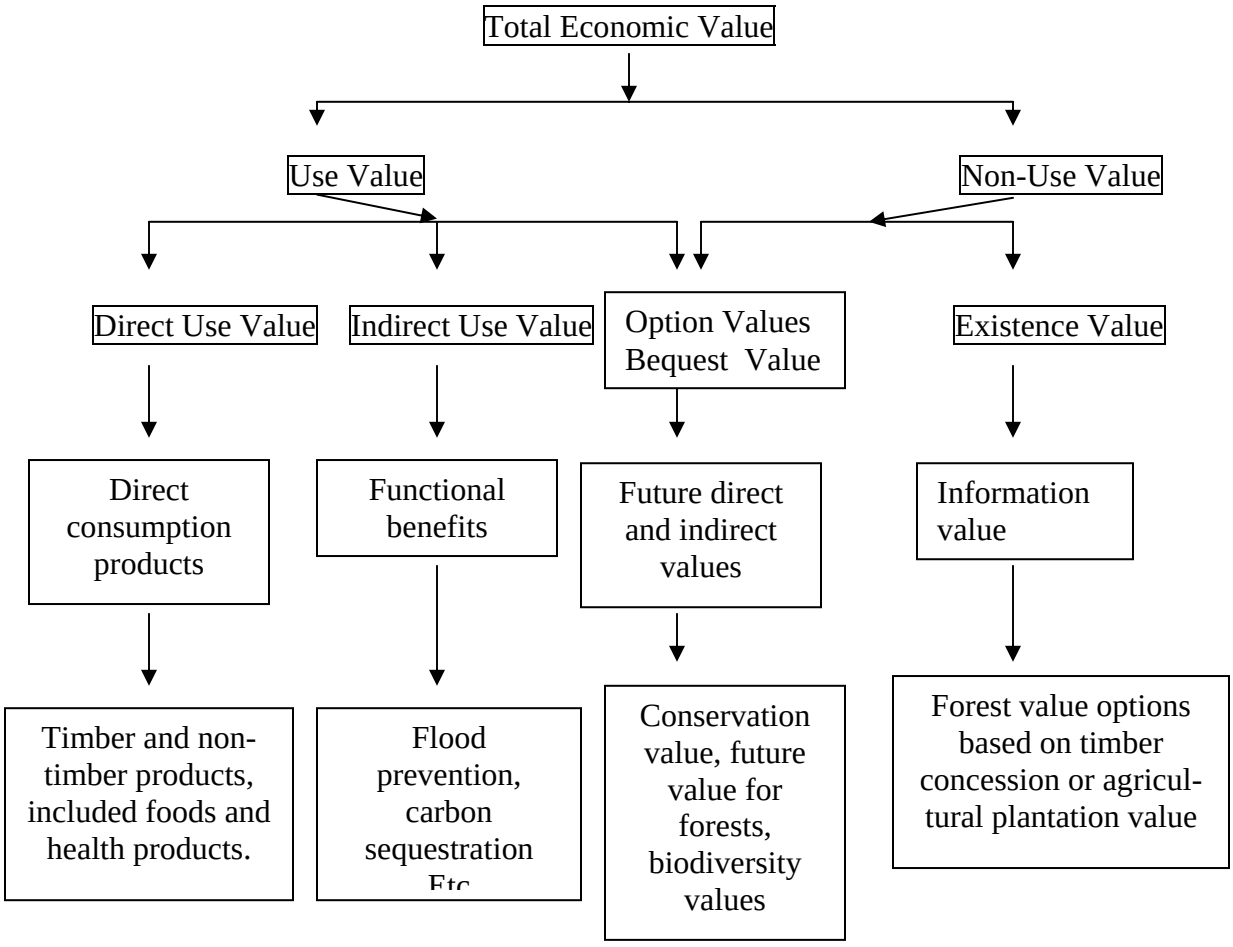

Figure 2.1 Model for Total Economic Value

2.6 Research Hypothesis

This study was conducted on the premise that the total economic value of the Benuaq Dayak's forest management should positively impact the role of the Benuaq Dayak tribes in Indonesian economic development. The Benuaq Dayak tribe's total

economic valuation can improve understanding of their management methods and offer insight into their economic contributions relative to other stakeholders. This can make the tribe's resource management regimes more competitive in comparison to the private companies.

H: The Benuaq Dayak's total economic value from forest management is greater than zero.

H_a: The Benuaq Dayak's total economic value from forest management equals zero.

The total economic value concept was employed to estimate the total economic values of Benuaq Dayak sustainable forest management. The use values were estimated through data collection of the Benuaq Dayak's daily activities. Surveys were conducted at three villages of the Benuaq Dayak on their direct use of forest products, both timber and non-timber forest products. These data were used to identify direct use values and indirect use values.

The perception of Benuaq Dayak's sustainable forest conservation for the present and future generations was also explored. Estimates of their willingness to pay extra transportation costs to non-tribal forest areas and their willingness to sacrifice consumption of forest products were made through the direct interviews. These estimated values were used to estimate the Benuaq Dayak's non-use values.

Direct use values, indirect use values and non-use values were added to generate total economic values. Sensitivity testing using net present value (NPV) was done to compare total economic value to the economic values of timber concession and plantation companies.

2.7 Research Methodology

To be able to calculate the total economic value of Benuaq Dayak natural resources management, the homogeneity of the ethnicity inside the research area was very important. There are many Dayak tribes in West Kalimantan province. Mixed ethnicity in the same village is very common. A pre-survey was conducted twice to determine the villages with homogenous ethnicity. The first pre-survey was conducted in the summer of 2000 and the second was conducted in the fall of 2001. In addition to ethnicity homogeneity, the pre-survey also identified villages that were maintaining traditional practices related to natural resources. The availability of local government support and the existence of local non-profit organizations in the area were also important considerations to ensure the success of the study.

Questionnaires were used to collect productivity data from each land use in each village. The data from three different villages were analyzed using statistical methods to ensure that similar conditions existed among the villages. Use economic value and non-use economic values were calculated for each village using mathematical calculations. Total economic value estimation was conducted for each individual village in addition to a total tribes estimate using net present value (NPV) methods. Methods employed in this research are explained in detail in the following sections.

2.7.1 Survey Questionnaire Methods

In order to calculate the total economic value of Benuaq Dayak natural resources management, it is important to understand tribal, cultural and ethnic backgrounds. Daily activities and resulting productivity need to be considered and calculated. Every activity

needs to be identified and classified into the right component of total economic value contribution.

The survey methods were divided into two parts. First was the identification of Benuaq Dayak land use patterns and associated productivities. Second, data collection was done using questionnaires. Land use pattern identification was conducted over seven days by questioning village leaders and other village residents. The survey was conducted in the Indonesian language. When the respondent was not fluent in Indonesian, local assistance helped the interviewer translate from the local language. The definitions of village practices were very carefully and clearly defined and explained. The information that was collected was used to refine the first draft of the questionnaire. The questionnaire component of the survey was conducted using 30 to 50 randomly selected households from the village. The questionnaires were written in the Indonesian language. The interviews were also facilitated by local assistants if the respondent did not clearly understand Indonesian. The data collection questionnaire survey process took about 20 to 30 days in each village.

The questionnaire was designed to collect individual household perceptions of use value and non-use value. The questionnaires for the use value data questioned the respondent on what kind of plants they planted at each land use, the yields for the current year, and what portion of those yields they sold to the market, both in quantities and prices. The questionnaires also questioned the respondent about how often they go to the river area, the forest and the garden. The frequencies defined the abundance yield that they receive on a weekly and yearly basis.

The questionnaires for non-use value questioned the respondent's perceptions of their forest value, their preference value, and their option value. The data that was collected from the surveys were classified into components that form the total economic value methods. The questionnaire form that was used is found in Appendix A.
The income per household, based on the land use yields and time these products were produced, was calculated using the survey results. A simple mathematical additive calculation was used to make the calculations.

2.7.2 Sustainable Activities Identification

As Dove (1988), Padoch and Peter (1993), and Peluso (1993) suggest, sustainable forest management is a way to maintain and provide biodiversity, as well as generate diverse and continuous sources of income. To measure whether the Benuaq Dayak natural resource management system is sustainable, the biodiversity richness inside each land use was measured. To measure the Umaq land use biodiversity, plots of 20x20 meters were formed. All the plant and tree species found inside the plot were identified and counted. To measure the biodiversity richness inside the Bengkar and Simpukng, vegetation transect methods were employed. This method is initiated by randomly choosing one point at the land use field in order to start drawing an imaginary line in the field. A plot of 20 x 20 meters was formed at one side of the imaginary line starting at the first random point. This plot was formed to count the number of species of trees with diameters at breast height (DBH) of 25 cm or more. Inside each 20x20 meter plot, a plot of 10x10 meters was formed overlapping within the first plot. The 10x10 meter plot was formed to count the species of trees with a DBH of 10 to 24 cm (poles and saplings). Further, inside each 10x10 meter plot, a 2x2 meter plot was formed

overlapping within the second plot. The 2x2 meter plot was used to count the number of species seedlings. Three sets of plots or 9 plots in total were developed along the imaginary line to survey the biodiversity richness inside each land use. The data results were compared to diversity richness at the concessionaire area, the plantation area, and at the primary forest areas.

2.7.3 Analysis

2.7.3.1 Village Profile Consistency

Since the research was implemented at three different villages of the Benuaq Dayak, the question was raised of whether those three villages had similar characteristics in terms of land use productivities, types of daily activities and varieties of incomes. Similarity between the three villages was required to get a representative total economic value for the Benuaq Dayak. To answer this question, the data from the survey was analyzed between and within the villages using Analysis of Variance (ANOVA) facilitated by the SPSS statistical program.

2.7.3.2 Use Value

Use value is one of the general economic concepts used to define the total economic value by evaluating the changes in people prosperities. In the context of this research, use value is estimated by how much benefit and yields that people directly or indirectly derive from the natural environment including forests, river areas, agriculture, and oceans. Use value is calculated by adding the direct use value and indirect use value.

2.7.3.3 Direct Use Value

Direct use value is estimated by calculating the amount of direct extraction from natural resources and the associated value using a market price (NRMP-USAIDa, 1996).

The direct value that the Benuaq Dayak extract from their natural resources was measured by using the survey data results. The data of how much productivity occurs in each land use and how often the yields were taken on a weekly basis were also analyzed. The data then were converted from the household-level to a village average on an annualized basis. For justification purposes, the optimal data were developed by using how much yields from the total that the households sent to market. Using the number or amount of the item that was sold and its price at the market, rounded as the total yield times the price, the optimal value for the item was derived. For example, to calculate total value of timber production per household is presented in equation 1:

Timber value per household = amount of timber extracted x market price.

To calculate total direct use value from the forest for the household, equation 2 is used:

Total DUV = {Σ(timber value)+(non-timber values)+ …+(Xn value)}- annual labor cost/hh/village

Estimate of annual labor cost (rupiah)/hh/village = total labour x labor days/person x labour rate x proportional use of adat land tenure.

The 27 percent of adat land tenure that is used is called Customary Forest Management System (CFMS) and is cited from SHK's village monographs data.

The net present value (NPV) for DUV = DUV/r, where r is the discount rate that expresses the economic situation in Indonesia over time. The common discounted rate that is usually applied by the Indonesian government or international publications is 15 percent.

The direct use value estimation per village was calculated based on an average per household in the village multiplied by the total household population in the village. The use value that was used for the total economic calculation was calculated by using the average of the estimated use value data from the three villages. The formula for this calculation is:

Estimated DUV from three villages = (DUVTepulang+DUV benung+DUVDingin)/3

2.7.3.4 Indirect Use Value

Indirect use value is a means to measure the function of forest products and the social costs that are worthless in terms of market price using the benefit-transfers-data methods (NRMP-USAIDa, 1996). Benefit-transfers data is the transfer and application of estimates of economic benefits of particular resources from previous studies to a site for which no such benefit values are available. The transfer of benefits assumes that the value of the resources in question is the same or similar value across the different sites (Pearce and Moran, 1994).

The indirect value is estimated by transferring the data that already exists. The carbon sequestration in the area per hectare and flood preventions costs are two types of data that could be transferred. These data exist from previous research and the calculations of others. These existing data used in the current research came from research areas that are similar to or from the area that is close to the Kutai Barat.

For the Benuaq Dayak total economic value estimation, the benefit-transfer data came from a publication of the Bogor Agriculture University published in 1999. The publication is titled *Kajian Sistem Nilai Hutan Produksi* which translates to English as: *Research on Production Forest Valuating System.* The book was written based on

research that was conducted on Kalimantan Island and Sumatera Island. The data that transferred to this research as part of the total economic value calculation are presented in the following sections.

2.7.3.5 Value for Erosion Prevention for Kalimantan Island

The erosion-prevention value contained in the Bogor Agriculture University publication is prediction data using the Morgan and Finney equation. The equation is: **Sedimentation = (C*(runoff)^2*Sin (elevation)*10^-3**.

The calculation was estimated for 16 years, starting in 1992 and extending to 2008. Based on the average value of erosion prevention multiplied by U.S. $1.5 per year per hectare, the erosion prevention value is calculated. The erosion prevention value reported in this publication was 2,589,661 rupiahs per hectare (U.S. $287 per hectare). These data were used in this research because they come from an area that has similar characteristics.

2.7.3.6 Value for Carbon Sequestration for Kalimantan Island

Benefit-transfer data for the carbon sequestration value for the forest area of Kalimantan Island was required in this research to express the forest function value. Data for this part of this research used existing data (Forestry Department-Bogor Agriculture University, 1999). Carbon sequestration is estimated through how much carbon dioxide (CO_2) the forest can absorb to produce oxygen (Forestry Department-Bogor Agriculture University, 1999). The carbon-sequestration values used were from two different timber concession companies in Central Kalimantan. These data were taken because it was concluded that this area has similar characteristics as the Kutai Barat District. Furthermore, the data is an estimation using the photosynthetic processes approach

developed by Baker (1950) in the Forestry Department of Bogor Agriculture University (1999):

4 ton H_2O + 12 ton CO_2 → 7 ton biomass + 9 ton O_2.

Based on this calculation, carbon sequestration potency for Kalimantan Island is 25,819,687.5 rupiahs per hectare per year, or $U.S. 2,868.854.

2.7.3.7 Non-Use Value

Non-use value is the benefit that people receive from nature without directly using natural products or perceiving the value. Non-use values can be measured by travel cost demand, hedonic property values, and contingency valuation models. Non-use values in this study were measured using a contingency valuation model to estimate the option value and existence value. The contingency value is a direct valuation method that involves asking people what they are willing to pay for a benefit and/or what they are willing to receive by way of compensation to tolerate a cost. The option value is the extra payment an individual is willing to pay to ensure that one can make use of the forest or natural resource in the future. The option value is represented the potential benefits, as opposed to the actual present use value. The existence value is a value that is placed on the forest area or natural resource area that has relationship to any actual or potential use of the good. Examples of goods include timber, wildlife, and water management (Environmental Valuation, 2000).

2.7.3.8 Option Value

To measure the option value, respondents were questioned about how much they would be willing to pay for additional transportation costs in order to conserve the goods they owned. Respondents were also asked about their willingness to reduce the

consumption they usually derive from the forest area. The value of their willingness to pay was developed by giving the respondents an imaginary story that framed their future forest situation. The story was that their forest in the future had been impacted by a high rate of extraction by their village people. In order to save the forest for future generations, village members agreed that they have to stop extracting products from their forests for 20 years in order to give it enough time to grow back to its original state. To compensate them for their needs, respondents are given choices of three existent forest locations that have three different conditions. Their first choice is a forest area that has a slightly better condition than their current forest. They would need to pay 10,000 rupiahs for transportation to get there. The second choice is a forest that is in good condition and in which most of the goods they need are easy to find. To get to the second choice area, the respondent has to pay 15,000 rupiahs for transportation. The third choice is a forest that has virgin forest conditions. All the goods that they need are there in abundance, but to get to the area, an additional 20,000 rupiahs is needed. The currency value of rupiahs to the dollar is 9,000 rupiahs for every U.S. dollar.

The estimated willingness to pay for the Benuaq Dayak is calculated by adding the additional transportation costs that the households are willing to pay for the current average transportation to the forest. The average from the household level then was used to calculate a village average and averages for the three villages in the study.

Willingness to reduce value was measured by giving the same imaginary framed story regarding future forests conditions. This time, instead of forbidding extraction from their forest, respondents are allowed to extract forest resources. To discern willingness to save their forests for their future generations, respondents were asked to reduce their

consumption from the forest area. Choices were given to reduce consumption from 0%-25%, 50%, 75% and 100% of what they were taking currently. The value of their willingness to reduce consumption was then calculated by using household data of how much is currently taken from the Bengkar (forest) multiplied by the percentage that they are willing to give up. The data were then converted to the village averages and then to an overall average for the three villages.

2.7.3.9 Existence Value

Existence value was estimated by questioning respondents about their preference of how their forest would be managed and used as either a plantation area, a forest concession, or for coal mining. Benefit-transfer data was used for these three choices as the values per hectare unit close to the research locations had already been established. The value of each land use includes investments costs, operation costs, and first-year profit. Benefit-transfer estimates and functions from these nearby locations were used for the research sites. The choice that the respondent selected was used to calculate the average village existence value. These averages were used to arrive at an average for the three villages.

2.7.3.10 Benefit-Transfer Data for Non-Use Value

Benefit-transfer data used for existence value estimation were taken from two different sources. First, data of total economic value for concession companies were taken from Bogor Agriculture University (1999) data collected in the Central Kalimantan Province. The reported total economic value for forest concession area is 119,716,504 rupiahs per hectare per year (U.S. $13,301 per hectare per year).

The second set of data is total economic value for a plantation company from Mangunsong (2000). Mangunsong (2000) data came from a palm oil plantation and included financial, environmental, and social costs. Using a 28-year period and a 15 percent interest rate, the total economic value for financial costs is U.S. $5,191.7 per hectare per year. Environmental cost and social cost gave a negative total economic value of U.S. $5,795 per hectare per year.

2.7.3.11 Total Economic Value

Total economic value for the Benuaq Dayak was calculated by adding the use value and non-use values discussed previously. The total economic value of the Benuaq Dayak was tested using cost and benefit analysis methods to explain sensitivity of the total value over 20 years. Comparisons of different land uses identified weaknesses and strengths of Benuaq Dayak resource management compared to private companies.

2.7.4 Study Variables

The variables used in estimations and the calculations for total economic value were use value and non-use value. The use value consists of direct value and indirect value. The information that was collected were type of plants, frequency of visitation to each land use per week/month/year, size of each land use area, yield per week/month/year, portion of yield sold to the market, its market price, and the portion of yield that was consumed by the household and relatives. The variables for direct value are:

- **Umaq**: Rice, corn, spices, fuelwood, fruits, vegetables, sweet potatoes
- S**impukng**: Fruits, rattan, rubber, medicinal plants, palm fruits, coffee, candlenuts, fuelwood, timber

- **Kebotn/Dukuh**: Rattan, Rubber
- **Uratn**: Construction wood/timbers, fuelwood, bamboo, rattan shoots, bamboo shoots, vegetables
- **Bengkar:** Meranti wood, bengkirai wood, ulin wood, natural rattan, honey, medicinal plants, traditional customs plants, saps or scented wood, animals/wild game
- **River:** Fish, shrimp, hay roofing material, sago, edible ferns
- **Livestock:** Pigs, poultry, cows, goats

In addition to income generated from each land use, additional household income from employment in other business was collected. Family members, occupation of the household adult members, and educational level information was collected. Household expense data were collected based on food, clothing, medical care, education, transportation, and traditional customary event costs.

2.8 Summary and Conclusions

The goal of this research is to estimate Benuaq Dayak resources management total economic value. This chapter discusses the survey methodology used to collect primary data for the research. Benefit transfer data were employed to estimate Benuaq Dayak option and existence values and to examine the homogeneity of characteristics between villages. In subsequent chapters, Benuaq Dayak total economic values will be compared to the current total economic value generated by timber concession and plantation companies. The comparisons will indicate the relative effectiveness of the Benuaq Dayak management techniques relative to those used by the private industrial companies.

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CHAPTER 3
DIRECT USE VALUE FOR BENUAQ DAYAK RESOURCE MANAGEMENT

3.1 A Brief Description of Indonesia

Indonesia is located in southeastern Asia between longitudes 95^{o} and 142^{o} east and latitudes 6^{o} north and 11^{o} south. It is an archipelago that extends 5,000 km along the equator between the Indian and Pacific Oceans, and consists of 13,677 islands. The climate of Indonesia is tropical with warm and humid conditions.

Indonesia is the fourth largest populated country in the world with a total population of 208, 452,952 people. The population growth rate is 1.49 percent (Factbook, 2004). Indonesia is characterized by the most ethnically diverse population in the world, with each segment having its own language and culture.

Source: http://www.odci.gov/cia/publications/factbook/print/id.html, downloaded 01/17/2005.

Figure 3.1 Indonesia Map

Indonesia is recognized as a major world center for biodiversity due to its wide range of natural habitat, rich plant and animal resources, and high number of island endemics. Forest products, agriculture, livestock, and fishery combined are the third largest source of revenue after manufactured products (Bappenas and USAID, 1993). As of 2003, Indonesia's national GDP was U.S. $758.8 billion with a growth rate of 4.1 percents.

3.2 The Benuaq Dayak

The Benuaq Dayak tribe, one of Indonesia's indigenous people, was used for the research sample. The tribe is located in the northern part of the East Kalimantan province, on the Kalimantan Island of Indonesia.

The Benuaq are a subgroup of the Luangan who belong to the Barito river language family and hold Hindu Kaharingan as their religion. The Hindu Kaharingan religion practices secondary mortuary rites and shamanism curing rituals (Seeland and Schmithusen, 2002).

The Benuaq tribe is stratified based on strata differences and marriage status (Seeland and Schmithusen, 2002). The highest leader in the village is considered the village head. This position is voted on by the village people and assigned officially by the government. The village leader mainly deals with economic and official activities at the village level. The traditional events of the village people and the official activities related to the traditional and cultural events are arranged by the adat leader (personal observations). The traditional adat law regulates most of the social aspects in the Benuaq Dayak tribe. A household in the Benuaq Dayak tribe generally consists of a married couple and their children (personal observations; Seeland and Schmithusen, 2002).

The Benuaq Dayak, in general, has an extensively cultivated, rain-fed agriculture system, supported by a variety of semi-wild plants from the surrounding forest areas (NRMP-USAID, 2000). The households use livestock as their meat and income source, along with the animals and plants that are collected from the forest areas. The dependency of the tribe on natural resources, including the forest area, has formed special land use patterns. The land use of the Benuaq Dayak is basically a constant changing of the forest areas to swiddens, then to forest gardens, and then allowing nature to turn the areas into forest again (Seeland and Schmithusen, 2002). In general, there are five different land uses practiced by the Benuaq Dayak: *Umaq, Simpukng, Uratn, Kebotn/Dukuh,* and *Bengkar.*

3.3 Research Overview

This research estimates the total economic value of the Benuaq Dayak management practices. The Benuaq Dayak is one of the indigenous tribes in Indonesia. This tribe is known for its sustainable way of managing natural resources. To estimate the total economic value, the availability of direct use value, indirect use value and non-use value are very important. The direct use value is all the benefits that the people have derived from nature that have worth in the local market (McCracken and Abaza, 2000). This chapter will evaluate the Benuaq Dayak's direct use value in detail. The direct use value results will then be used to estimate the tribe's total economic value. The research was conducted at three different villages located in the Kutai Barat District, East Kalimantan Province, Indonesia: Tepulang, Benung, and Dingin.

The Benung and Tepulang Villages are located inside the Idaatn watershed of the upper Mahakam River. Benung has a total population of 54 households consisting of 257

people. The land use pattern of the Benung Village is shown in figure 3.2. Members of the SHK Organization in the field and the Benung Village members worked together to create this map. Figure 3.2 is cited from SHK village monograph (2000)

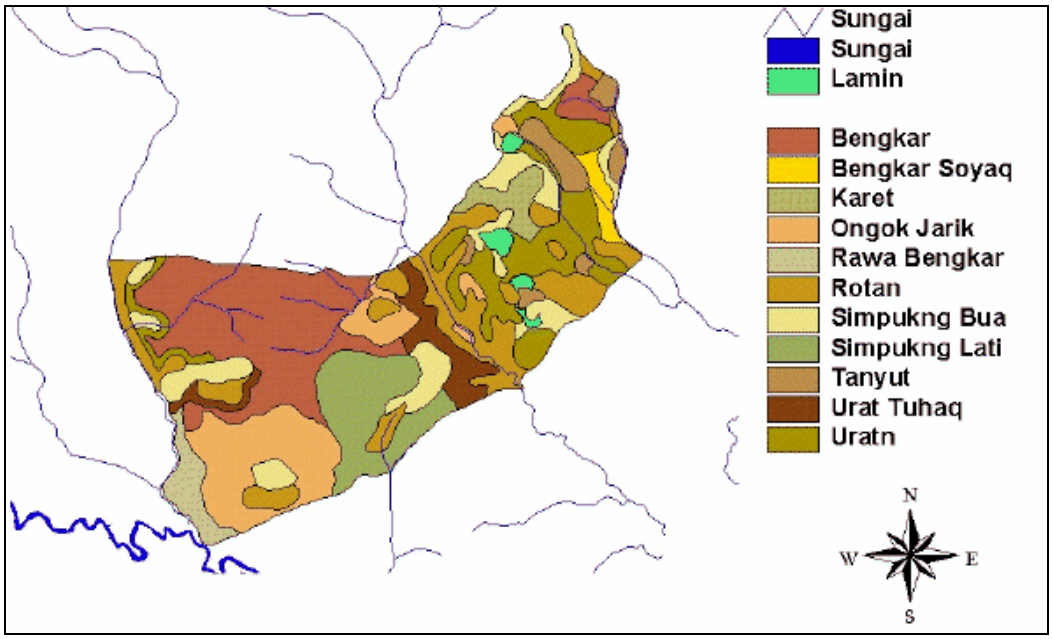

Figure 3.2 Benung Village Traditional Land Use Map

The Tepulang Village has a total population of 64 households consisting of 245 people. The land use pattern map of the Tepulang Village is shown in figure 3.3 and was also created by members of the SHK Organization and the Benung Village members. Figure 3.3 is cited from SHK monograph (2000)

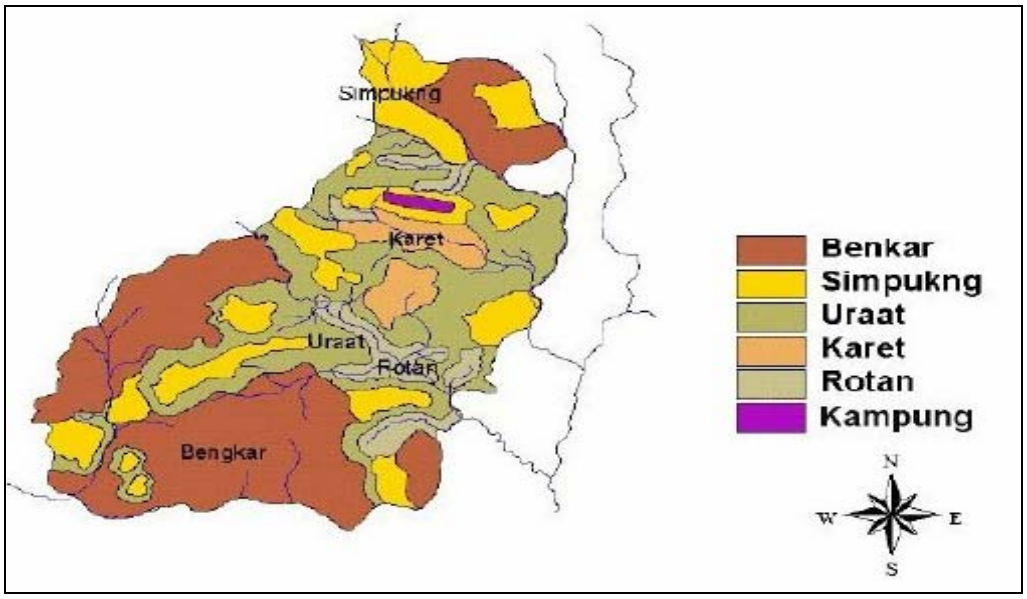

Figure 3.3 Tepulang Village Traditional Land Use Map

The Dingin Village is located in the Kedang Pahu watershed. The Dingin Village has a total population of 233 households, consisting of 960 people. The land use pattern of the Dingin Village is shown in figure 3.4. Figure 3.4 is cited from Dingin village official map (2002).

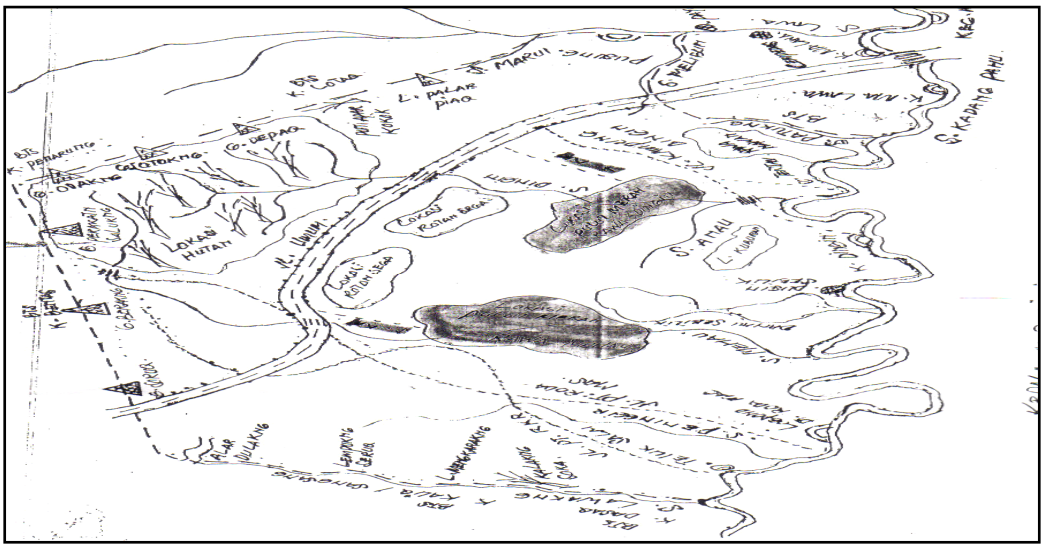

Figure 3.4 Dingin Village Traditional Land Use Map

The research area can only be reached by speedboat with a travel time of about 7 hours from the provincial capital of Samarinda. The three villages of Tepulang, Benung, and Dingin were selected as the research areas because they have maintained 100 percent Benuaq Dayak ethnicity and are still using traditional customs in managing their natural resources.

The three villages have a total combined population of 1,462 people and 351 households. The total combined area of the three villages is about 41,662.00 hectares. The research areas have a typical tropical weather pattern with an average temperature of 25 to 26 degrees Celsius. The annual rainfall of the area ranges between 1,700 and 3,500 mm/year and normally falls over a period of between 60 and 100 days. The soil type at the areas is alluvial lowland along the river and inceptisols and spondosol in the dry areas (Seeland and Schmithusen, 2002). The detailed data per village are listed in table 3.1. The table is cited from SHK village monograph (2000).

Table 3.1 Basic Data from the Three Villages

Type of Data\Area	**Tepulang**	**Benung**	**Dingin**
Total households (hh)	64	54	233
Total population	245	257	960
Average hh size	3.83	4.76	3.6
Sample of hh taken by survey	25	25	45
Total study area size (hectare)	3,782	3,880	39,000

The land use of Benuaq Dayak, in general, consists of five different types: *Umaq, Simpukng, Uratn, Kebotn/Dukuh, and Bengkar*. The detail explanation for each land use is presented in the following sections.

3.3.1 Umaq (Paddy and Annual Crop Field)

The Benuaq Dayak tribe's primary agricultural activities are at the Umaq. The Umaq is an extensively cultivated, rain-fed agriculture plot planted with a variety of semi-wild plants from the forest and surrounding areas. The Umaq contains the first sources of staple food for the tribe, such as paddy and sticky rice, maize, cassava, various vegetables and sometimes fruits and fuel woods. The planting system has a typical cropping cycle of one year. The Umaq is usually cultivated for two to three years and then it becomes fallow land, called Uratn, for about five years.

3.3.2 Uratn or Uraaq (Fallowed Field)

Uratn is the fallow area that used to be an Umaq. This area is cultivated at the end of the Umaq phase. The plants consist of certain fruit and timber trees and also wild pioneer trees that are useful for fuel woods. After its fallow time, Uratn area will turn into Simpukng, Kebotn, or Bengkar area.

3.3.3 Kebotn/Dukuh (Fruit Garden around the House)

Kebotn is the garden area located around the house planted with fruits, simple vegetables and medicinal plants. This area, to a certain extent, plays an important role as the source of food and additional income for the household. It produces fruits and vegetables that can be sold at the local market.

3.3.4 Simpukng (Agro-Forestry Field)

The Simpukng is the area that has plants or trees that are five-years-old or more. It has many different fruit trees and other economically worthy tree species such as rubber, pines, rattans and timber. The Simpukng is owned by an extended family in a long house consisting of at least five to ten nuclear families. The access to the Simpukng

area is not limited to the owner only, but it is open for people out side the village. They may take as many of the fruits as they need without permission as long as they do not sell them. This area is designed for public services with certain limitations applied. At present, the charity function has diminished because people tend to take more than they need in order to sell the fruits. However, people from other villages still have access to the fruits with permission from the owner.

3.3.5 Bengkar (Reserved Forest Area)

The Bengkar is usually the area that is called forest. The Bengkar is owned by the village and managed in general under the village boards. The village board consists of a village leader, village administrators and the customary leader (ketua adat). The Bengkar is the main source of building materials (e.g., timber, bamboo, and rattan), medicinal and ritual plants, wild vegetables, and hunted animals (e.g., wild pigs, birds, and deer) for the village members.

The Benuaq Dayak way to manage natural resources is believed to be sustainable. Research has shown that the Benuaq Dayak tribe has maintained management practices that can give them a variety and continuity of income. These activities included shifting cultivation, hunting and collecting various forest products, small-scale handicraft productions and tourism activities (NRMP-USAID, 1996). Dove (1988) found in his research in Kalimantan that the tribe could incorporate the swidden food crops and smallholder export crops in their forest area management to meet their daily needs and consumer goods. The combination of subsistence and market-oriented agriculture has proven successful and is an important contribution to the national income. Padoch (1992) found that the tribe not only slashed and burned, hunted, and harvested; but, that they also

manipulated and managed the animal population in subtle ways often invisible to the scientist and traveler's eye. Padoch and Peluso (1996) explained that the tribe has considerable variety and change in the economic activities of individual households, as well as far richer and more dynamic "agrodiversity" on the island as a whole. Thus, the tribe increases biodiversity and provides diverse and continuous sources of income for themselves and the nation. Their management involves sustenance of forest products, socio-cultural traditions, and environmentally friendly practices. In short, Benuaq Dayak management is sustainable forest management because it maintains biodiversity and also continuous sources of income.

Unfortunately, the Banuaq Dayak way of management is difficult to measure in terms of economic value. The need to calculate this economic value is critical for the Benuaq Dayak's existence as it will help them to gain the respect of the government and other stakeholders related to natural resources management. This, in turn, will hopefully lead to changes in policy that will permit continuation of the Dayak way of life.

3.4 Research Objectives

This chapter's objective is to specifically estimate the direct use value of the Benuaq Dayak's sustainable forest management in order to support the process of estimating their total economic value. The estimated direct use value will be calculated from the Benuaq Dayak tribe's daily, weekly and annual productivities.

3.5 Theoretical Framework for Direct Use Value

The direct use values are estimated by methods that elicit preferences by either conducting experiments or by using questionnaire-based surveys, usually using local market prices (McCracken and Abaza, 2000).

A survey-based approach was applied to estimate direct use values. Benuaq Dayak management productivity was collected on timeframe-specific bases (daily, weekly, monthly and yearly). Local market prices were used to estimate economic productivity values. Local annual labor costs per person per village were estimated based on the survey results and SHK village monographs (2000), and were deducted from annual productivity values to arrive at net direct use values.

3.6 Research Hypotheses

This study was conducted on the premise that the total economic value of Benuaq Dayak's forest management should positively impact the role of the Benuaq Dayak tribe in Indonesian economic development. The Benuaq Dayak tribe's total economic valuation can improve understanding of their management methods and offer insight into their economic contributions relative to other stakeholders. This can make the tribe's resource management regimes more competitive in comparison to private companies.

The direct use value is one important component of the total economic value calculation. Direct use value is estimated by calculating the Benuaq Dayak's land use productivity on a daily, weekly and annual basis. Since the Benuaq Dayak's management deals with a relatively smaller area in comparison to the timber concessionaire or agricultural plantations, the productivity per item will be less but the diversity will be high. The hypotheses are:

H1: The Benuaq Dayak biodiversity is equal to or higher than that generated by private company management practices.

$H1_a$: The Benuaq Dayak biodiversity is less than that generated by private company management practices.

H2: The Benuaq Dayak's direct use economic value of their forest management is equal to or less than that generated by private company management practices in the long-term.

$H2_a$: The Benuaq Dayak's direct use economic value from forest management is higher than that generated by private company management practices in the long-term.

3.7 Methodology and Justification

3.7.1 Survey to Test for Tribe Homogeneity

To be able to calculate the total economic value of Benuaq Dayak's natural resources management, the homogeneity of the ethnicity inside the research area was very important. There are many Dayak tribes in the West Kalimantan province. Mixed ethnicity in the same village is very common. A pre-survey was conducted twice to determine the villages with homogenous ethnicity. The first pre-survey was conducted in the summer of 2000 and the second was conducted in the fall of 2001. In addition to ethnicity homogeneity, the pre-survey also identified villages that were maintaining traditional practices related to natural resources. The availability of local government support and the existence of local non-profit organizations in the area were also important considerations to ensure the success of the study.

3.7.2 Survey Questionnaire Methods

Questionnaires were used to collect productivity data from each land use in each village. The data from the three different villages were analyzed using statistical methods to ensure that similar conditions existed among the villages. Use economic value and non-use economic values were calculated for each village using mathematical calculations. Total economic value estimation was conducted for each individual village

in addition to a total tribe estimate using net present value (NPV) methods. Methods employed in this research are explained in detail in the following sections.

The survey methods were divided into two parts: first was the identification of the Benuaq Dayak's land use patterns and associated productivities, and, second, data collection was done using questionnaires. Land use pattern identification was conducted over seven days by questioning village leaders and other village residents. The survey was conducted in the Indonesian language. When the respondent was not fluent in Indonesian, local assistance helped the interviewer translate from the local language. The definitions of village practices were very carefully and clearly defined and explained. The information that was collected was used to refine the first draft of the questionnaire.

The questionnaire component of the survey was conducted using 30 to 50 randomly selected households from the village. The questionnaires were written in the Indonesian language. The interviews were also facilitated by local assistants if the respondent did not clearly understand Indonesian. The data collection questionnaire survey process took about 20 to 30 days in each village.

The questionnaire was designed to collect individual household perceptions of use value and non-use value. The questionnaires for the use value data questioned the respondent on what kind of plants they planted at each land use, the yields for the current year, and what portion of those yields they sold to the market, both in quantities and prices. The questionnaires also questioned the respondent about how often they go to the river area, the forest and the garden. The frequencies defined the abundance yield that they have received on a weekly and yearly basis.

3.7.3 Sustainable Activities Identification

To measure whether the Benuaq Dayak natural resource management system is sustainable, the biodiversity richness inside each land use was measured. To measure the Umaq land use biodiversity, plots of 20x20 meters were formed. All the plant and tree species found inside the plot were identified and counted. To measure the biodiversity richness inside the Bengkar and Simpukng, transect methods were employed. This method is initiated by randomly choosing one point at the land use field in order to start drawing an imaginary line in the field. A plot of 20 x 20 meters was formed at one side of the imaginary line starting at the first random point. This plot was formed to count the number of species of trees with diameters at breast height (DBH) of 25 cm or more. Inside each 20x20 meter plot, a plot of 10x10 meters was formed overlapping within the first plot. The 10x10 meter plot was formed to count the species of trees with a DBH of 10 to 24 cm (poles and saplings). Further, inside each 10x10 meter plot, a 2x2 meter plot was formed overlapping within the second plot. The 2x2 meter plot was used to count the number of species seedlings. Three sets of plots or 9 plots in total were developed along the imaginary line to survey the biodiversity richness inside each land use. The data results were compared to diversity richness at the concessionaire area, the plantation area, and at the primary forest areas.

3.8 Analysis

3.8.1 Village Profile Consistency

Since the research was implemented at three different villages of the Benuaq Dayak, the question was raised of whether those three villages had similar characteristics in terms of land use productivities, types of daily activities and varieties of incomes.

Similarity between the three villages was required to get a representative total economic value for the Benuaq Dayak. To answer this question, the data from the survey was analyzed between and within the villages using Analysis of Variance (ANOVA) facilitated by using the SPSS statistical program.

3.8.2 Sustainable Activities and Biodiversity

The estimated diversity within the land use is calculated by averaging the number of different plants of three plots. The average from every land use level then was used to calculate a village average and averages for the three villages in the study. The data results were compared to diversity richness at the concessionaire area, the plantation area, and at the primary forest areas.

3.8.3 Direct Use Value Concept

Direct use value is estimated by calculating the amount of direct extraction from natural resources and the associated value using a market price (NRMP-USAIDa, 1996). The direct value that the Benuaq Dayak extracted from their natural resources was measured by using the survey data results. The data of how much productivity occurs in each land use and how often the yields were taken on a weekly basis were also analyzed. The data then were converted from the household-level to a village average on an annualized basis. For justification purposes, the optimal data were developed by using how much yield from the total that the households sent to market. Using the number or amount of the item that was sold and its price at the market, rounded as the total yield times the price, the optimal value for the item was derived. For example, to calculate the total value of timber production per household, the following formula is used:

Timber value per household = amount of timber extracted x market price.

To calculate the total direct use value from the forest for the household, the following formula is used:

Total DUV = {Σ(timber value)+(non timber value)+ …+(Xn value)} – annual labor cost/hh/village

Where the annual labor cost = total labor x labor days/person x labor rate x proportional use (0.27)

Proportional use of 27 percent was cited from the SHK village monograph 2000 data year. The percentage was calculated from the total labor days and the real traditional labor days. The net present value **(NPV) for DUV = DUV/r**, where r is the discount rate that expresses the economic situation in Indonesia over time. The common discounted rate that is usually applied by the Indonesian government or international publications is 15 percent. The direct use value estimation per village was calculated based on an average per household in the village multiplied by the total household population in the village. The use value that was used for the total economic calculation was calculated by using the average of the estimated use value data from the three villages. The formula for this calculation is:

Estimated DUV from three villages=(DUVTepulang+DUV Benung+DUVDingin)/3

To use the simple formula estimation above, the assumptions in table 3.2 are applied:

Estimate of annual labor cost (rupiah/hh/village) 2,3 x 300 x 16,000 x 27% = 2,980,800

Table 3.2 Model Assumptions

General assumption:

Discount rate: 15%

Exchange rate (Rp/U.S. $) 9,000.00

Land area, population, and household size:

	Study area		
	Tepulang	Benung	Dingin
Total study area size (ha)	3,782	3,880	39,000
Total households (hh)	64	54	233
Total population	245	257	960
Average hh size	3.83	4.76	3.60

Labor assumptions:

Total labor per hh (15<age<65)	2.3
Labor days/person (50 weeks x 6 days work)	300
Wage labor rate (rupiah/day)	16,000

(source : SHK village monographs data from 2000 and 2002 survey results)

3.9 Study Variables

The variables used in estimations and the calculations for direct use value were collected types of plants, frequency of visitation to each land use per week/month/year, size of each land use area, yield per week/month/year, portion of yield sold to the market, its market price, and the portion of yield that was consumed by the household and relatives. The variables for direct value are:

Umaq:

- Rice, corn, spices, fuelwood, fruits, vegetables, sweet potatoes

Simpukng

- Fruits, rattan, rubber, medicinal plants, palm fruits, coffee, candlenuts, fuelwood, timber

Kebotn/Dukuh

- Rattan, Rubber

Uratn

- Construction wood/timbers, fuelwood, bamboo, rattan shoots, bamboo shoots, vegetables

Bengkar

- Meranti wood, bengkirai wood, ulin wood, natural rattan, honey, medicinal plants, traditional customs plants, saps or scented wood, animals/wild game

River

- Fish, shrimp, hay roofing material, sago, edible ferns

Livestock

- Pigs, poultry, cows, goats

3.10 Direct Use Values Results

The research results will be described in three components: (1) village profile consistency; (2) natural resource productivity for the Benuaq Dayak; and (3) direct use value for the Benuaq Dayak. Table 3.3 shows the summary ANOVA results and the detailed table of direct use value of every land use in the Benuaq Dayak tribe is in appendix B.

3.10.1 Village Profile Consistency

The statistical calculation that the SPSS program implemented divided the data into seven categories based on the Benuaq Dayak's land uses: livestock, Umaq, Simpukng, Kebotn/Dukuh, Uratn, Bengkar and river.

3.10.1.1 Livestock

According to the data analysis results, livestock activity between the three villages is significantly different. The P value for livestock calculation is 0 with the confident interval of 95 percent shows significant differences between the three villages regarding their economic results from livestock activities. Further, the calculation has revealed that the Tepulang Village has a higher yield from livestock than the other two villages. The Dingin Village has the lowest yield from livestock activities because the village is located near the river. The Dingin Village might benefit from focusing their activities on the river areas. Figure 3.5 shows the average mean of livestock yields for the three villages.

3.10.1.2 Umaq Land Use

For the Umaq activities, the P value is 0.364 with the confident interval of 95 percent. That means there are no significant differences between Umaq activities across the three villages. In other words, responses from the three villages have slightly diversity in terms of yield, variety of products, and level of dependency on Umaq land use income. Further, the graphs show that the Dingin Village has a wide variety of yield among its people. The Tepulang Village has higher economic yields from its Umaq production compared to the other two villages. The variety of yields among the Benung Village people is small, meaning that the people in Benung have relatively the same productivity. Figure 3.6 shows the average mean of Umaq for the three villages.

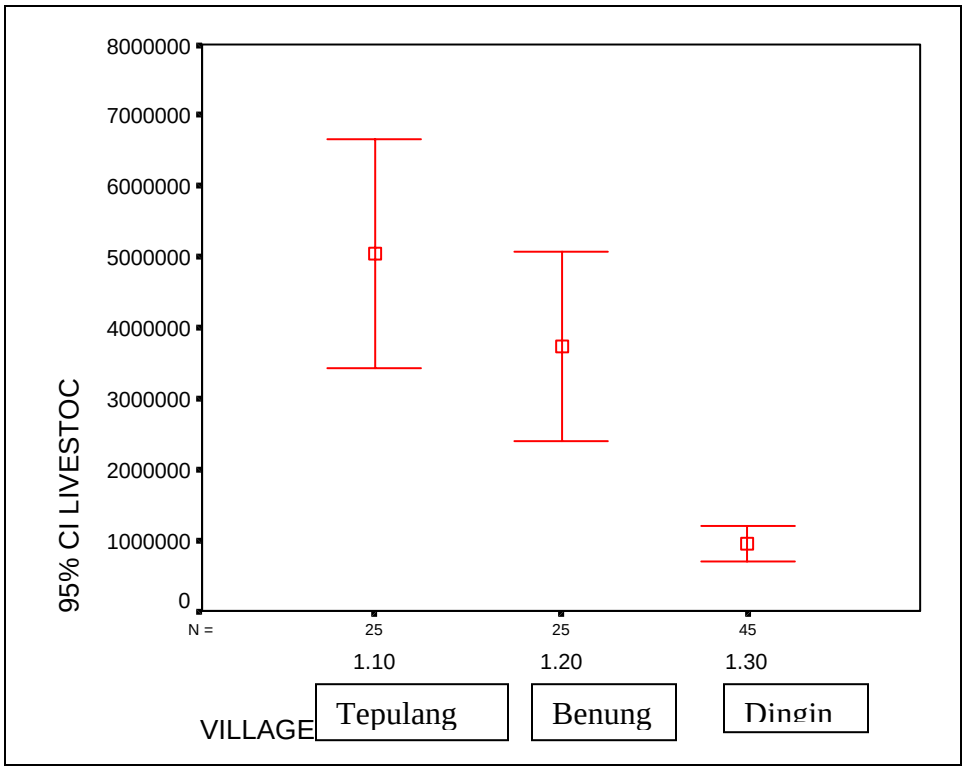

Figure 3.5 The Average Mean of Livestock Yields at the Three Villages

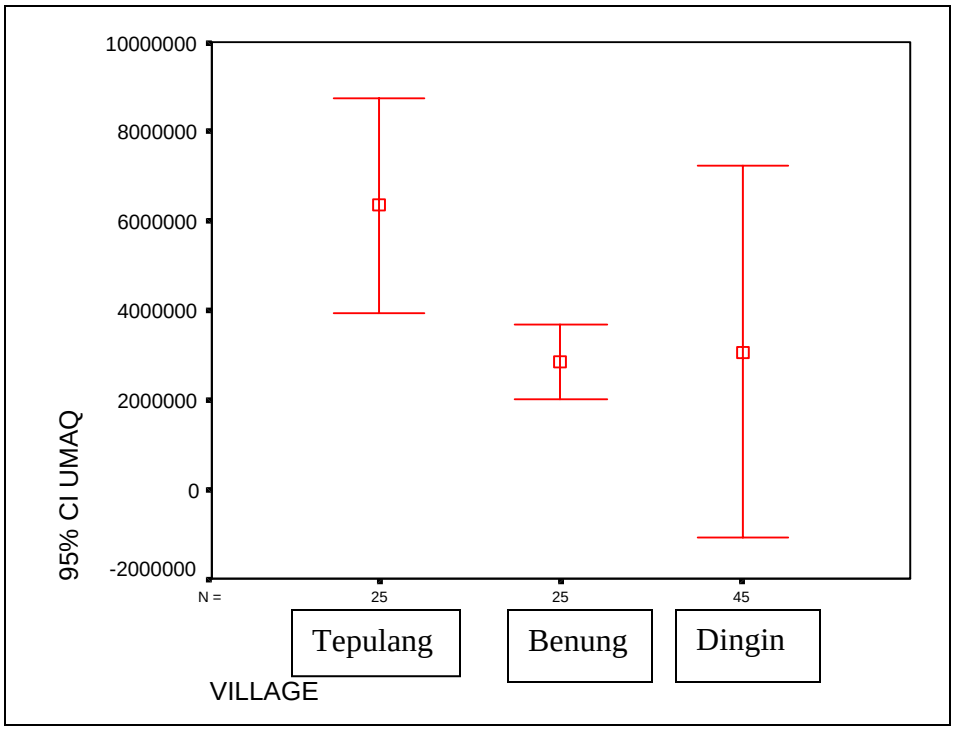

Figure 3.6 The Average Mean of Umaq at the Three Villages

3.10.1.3 Simpukng Land Use

For Simpukng activities, the ANOVA calculation result for the P value is 0.167 with the confident interval of 95 percent. This means the calculation results show that Simpukng land use productivities in the three villages were not significantly different in terms of conditions, productivities and yields.

The graphs also show that the Tepulang Village people have more variety in their Simpukng productivity and yield. The Benung Village has the highest average for their Simpukng productivities and yield compared to the other two villages. Figure 3.7 shows the average Simpukng yield for the three villages.

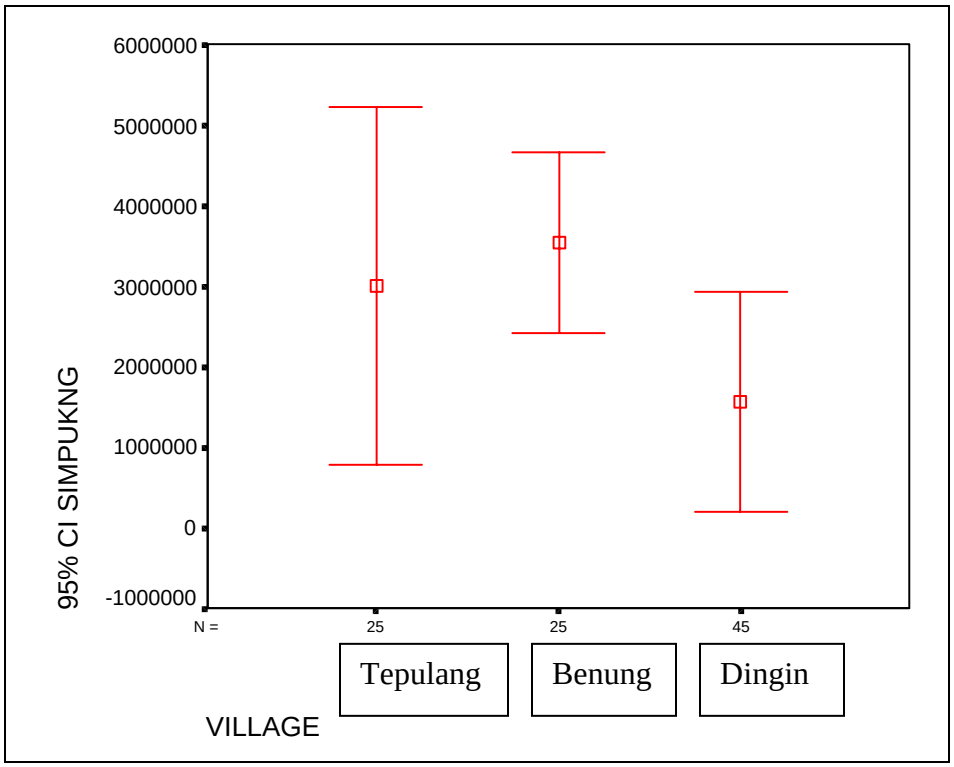

Figure 3.7 The Average Mean of Simpukng at the Three Villages

3.10.1.4 Kebotn/Dukuh Land Use

For the Kebotn activities, the ANOVA calculation result for the P value is 0 with the confident interval of 95 percent. The results have shown that the Kebotn land use activities for the three villages are in significantly different in terms of productivity and yield. The graph shows that the variety of yield and productivity at the Dingin Village is a lot smaller than the other two villages. The Dingin Village has lower yields and it varies in comparison to the other two villages. This is because the Dingin Village has had many problems with forest fires. The forest fires have destroyed a lot of their Kebotn, Uratn, and Bengkar areas. Figure 3.8 shows the average mean of Kebotn yield for the three villages.

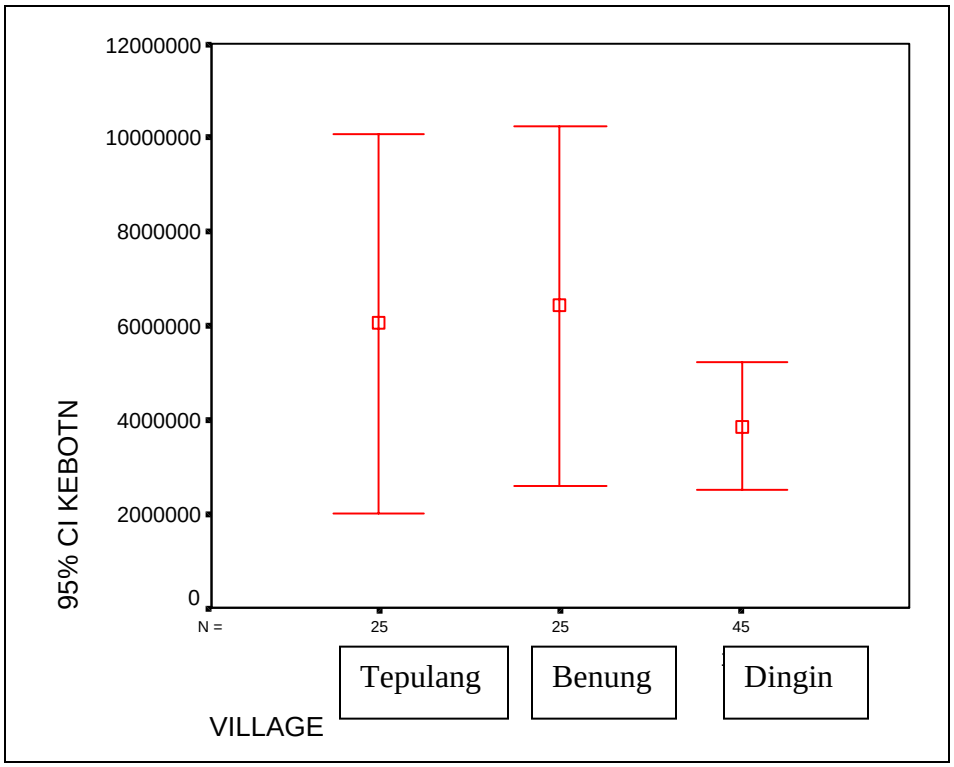

Figure 3.8 The Average Mean of Kebotn at the Three Villages

3.10.1.5 Uratn Land Use

For the Uratn activities, the ANOVA calculation result for P value is 0.008 with the confident interval of 95 percent. This means that the Uratn land use activities at the three villages are significantly different. The Tepulang Village has small productivity and very little of it, whereas the Benung and Tepulang Village have higher yields. The Dingin Village has a larger variety of productivity and yield because of the abundance of post-forest fire areas. Figure 3.9 shows the average mean of Uratn yield for the three villages.

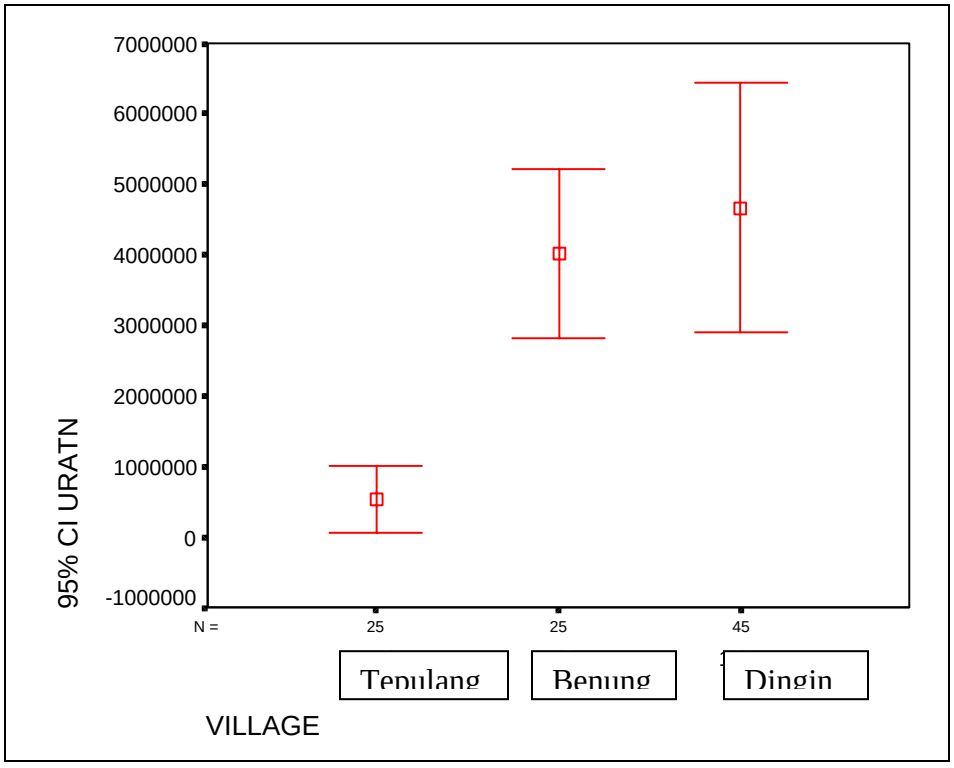

Figure 3.9 The Average Mean of Uratn at the Three Villages

3.10.1.6 Bengkar Land Use

The Bengkar activities calculation result for P value is 0.544 with the confident interval of 95 percent. This means that the Bengkar land use activities for the three villages were slightly not in the same situation. The averages of the yields and productivity are much different. At the Benung Village, the variety of activities, productivity and yields for Bengkar land use are higher compared to the other two villages. This is because the Benung Village already established forest village area seven years ago. Figure3.10 shows the average mean of Bengkar yields for the three villages.

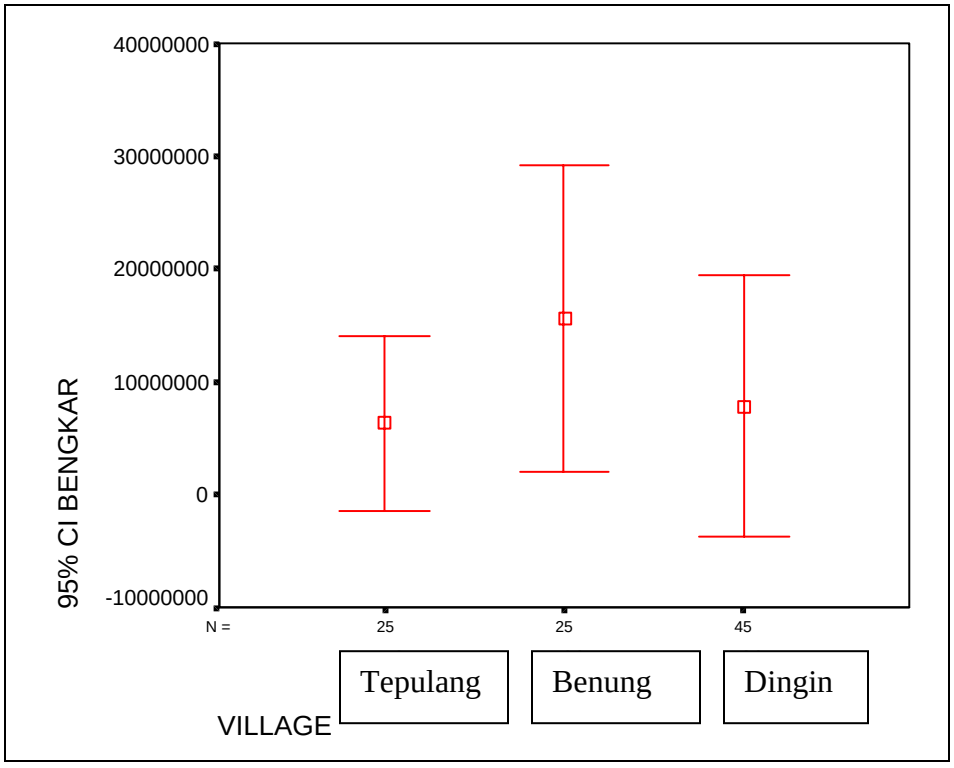

Figure 3.10 The Average Mean of Bengkar at the Three Villages

3.10.1.7 River Area

For the river area activities, the ANOVA calculation results for its P value is 0.523 with the confident interval of 95 percent. This means that the three villages do not have large differences in their mean averages in terms of yield and productivity. The graph 3.7 confirms that even though the Benung Village has higher variations in the village yield and productivity. Generally speaking, the three villages have almost the same level of averages. Figure 3.11 shows the average mean of river area yield for the three villages.

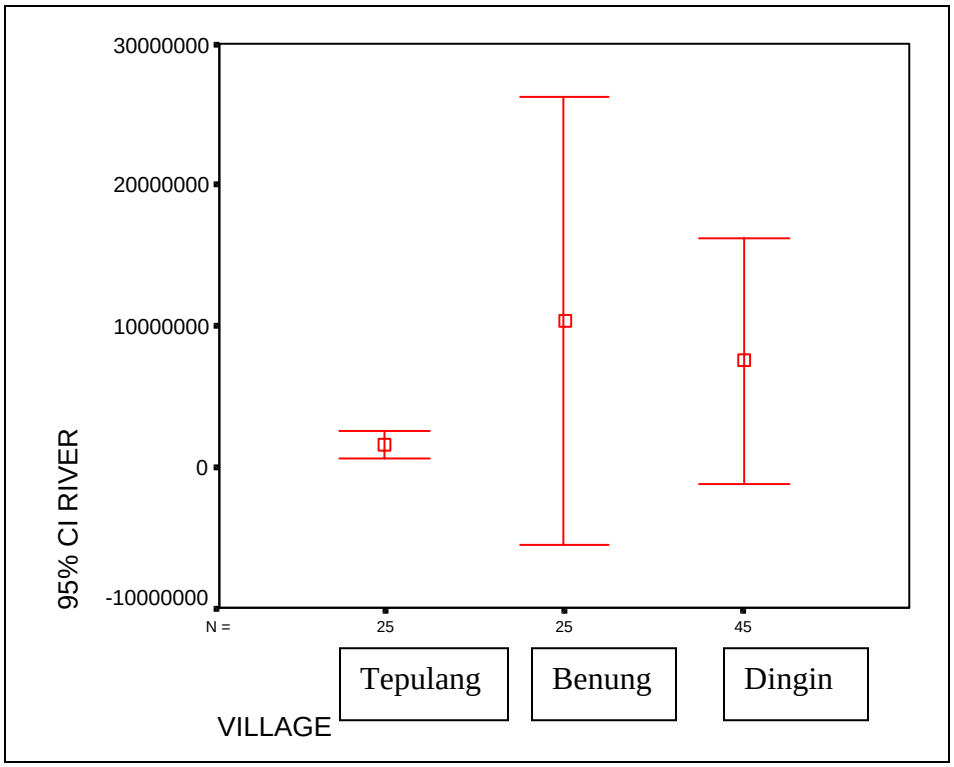

Figure 3.11 The Average Mean of River Area Yields at the Three Villages

3.10.1.8 The Benuaq Dayak's Village Profile Consistency

It is important to be able to calculate the total economic value of Benuaq Dayak's natural resources management. The homogeneity of the ethnicity inside the research area was also very important. The ANOVA test that was implemented to see the village profile consistency has given positive results. There were not many differences in productivities and yields in their seven land use practices. The statistical calculation has shown that out of seven land uses, there were three land uses with significantly consistent. Based on that fact, the three sample villages that were taken are homogenous enough to represent the Benuaq Dayak.

3.10.2 Natural Resources Productivities of the Benuaq Dayak

It is believed that the Benuaq Dayak's management could enrich their biodiversity at the landscapes. This is based on the nature of the Benuaq Dayak and their openness to new technologies or knowledge. For example, the Benuaq Dayak used to collected rubber sap from the forest. The rubber tree (*Hevea brasiliensis*) was introduced to Kalimantan Island in 1909 (Seeland, K,. 2000). As technology progressed a new clone of the rubber tree was created in the 1950s that offered a better quality and more saps. The Benuaq Dayak accepted the technology right away since it would give them more economic prospectus. Michael Dove (1993) has shown that the Dayak tribes have shifted from their natural local rubber species to the *Hevea braziliensis* species that has given their neighboring village better rubber sap productivity

Table 3.3 Summary of Land Use Homogeniety ANOVA results

		df	Mean Square	F	Sig.
RIVER	Between Groups	2	517069086419754.000	.652	.523
	Within Groups	92	792611796388395.000		
	Total	94			
LIVESTOCK	Between Groups	2	151601526767352.100	21.364	.000
	Within Groups	92	7096070077172.950		
	Total	94			
UMAQ	Between Groups	2	103717043031177.200	1.023	.364
	Within Groups	92	101395162812029.800		
	Total	94			
SIMPUNK	Between Groups	2	35600329649288.320	1.822	.167
	Within Groups	92	19536503432376.280		
	Total	94			
KEBOTN	Between Groups	2	14262210798108280.000	16.181	.000
	Within Groups	92	881424082146164.000		
	Total	94			
URATN	Between Groups	2	55999090350621.500	5.121	.008
	Within Groups	92	10935052701520.660		
	Total	94			
BENGKAR	Between Groups	2	669528728277197.000	.613	.544
	Within Groups	92	1091832177533054.000		
	Total	94			

.

The traditional way to convert the forest area to Umaq, or subsistence agriculture, enriches the landscape. The Benuaq Dayak usually opens the forest area to create Umaq for two to three years. At the end of the Umaq period, the land is planted with some fruit and timber trees before it is fallowed for 10 to 20 years. The fallowed area becomes Simpukng or Bengkar. Besides the natural succession processes with the local plants, the Dayak has enriched the local biodiversity with the tree species.

To show whether the biodiversity richness of the Benuaq Dayak is better than the timber concession company, the biodiversity measurement was implemented at the three sample villages. The results are presented in table 3.4.

Table 3.4 The Biodiversity Richness in the Three Villages

	Tepulang				**Benung**				**Dingin**			
	1	***2***	***3***	***avg***	***1***	***2***	***3***	***avg***	***1***	***2***	***3***	***avg***
Umaq	21	12	17	17	3	15	15	11	18	13	25	19
Simpukng	13	16	7	12	15	13	17	15	13	11	17	14
Bengkar	37	40	37	38	27	41	36	35	19	18	23	20

The second and the third plots have the same high biodiversity of 15 species. The Dingin Village has an average Umaq biodiversity richness of 18.67 species. The third plot of Umaq has the highest biodiversity of 25 species. The Dingin Village in fact has the highest biodiversity of the Umaq areas. It is because the village strives to make more income from the Umaq areas to compensate for the loss of the burned Simpukng, Kebotn and Bengkar areas.

The average biodiversity richness at Umaq land uses across the three villages can be as high as 15.33 species.

3.10.2.2 Simpukng Areas

At the Simpukng area, the Tepulang Village has an average biodiversity richness of 12. The highest biodiversity richness is at the second plot with 16 species. The Benung Village biodiversity richness at the Simpukng area is an average of 15 species. The highest biodiversity richness is at the third plot with 17 species. The Simpukng area at the Dingin Village has an average biodiversity richness of 13.67 species. The highest biodiversity richness is in the third plot with 17 species

The average biodiversity richness at Simpukng land uses across the three villages can be as high as 14.89 species.

3.10.2.3 Bengkar Areas

At the Bengkar area, the Tepulang Village has an average biodiversity richness of 38 species per plot. The second plot has the highest biodiversity richness with 40 species. The Benung Village's Bengkar has an average biodiversity richness of 34.67 species. The highest biodiversity richness is in the second plot with 41 species. The Bengkar at Dingin Village has an average biodiversity richness of 20 species. The highest biodiversity richness is in the third plot with 23 species.

The average biodiversity richness at Bengkar land uses across the three villages can be as high as 31.56 species.

3.10.2.4 Biodiversity Richness at the Benuaq Dayak's Management

The biodiversity richness at the Benuaq Dayak has increased overtime. The Umaq land use that is used more often for the Benuaq Dayak's daily activities has 15

species or more. The Simpukng land use that is located closer to the tribe's house or village, and has old standing trees, has 15 species and is the least diverse.

The Bengkar land use that is used as a reserved forest area for the tribe has even more diversity. Its average diversity of 32 species is a lot higher than the plantation area or timber concessionaire that generally plants less than 4 species in the area.

3.10.3 Direct Use Value for the Benuaq Dayak

The survey result on direct use value for the three different villages is summarized in table 3.5.

Table 3.5 Land Uses Productivity at the Three Villages (in 1,000 rupiah/year)

Village	Livestock	Umaq	Simpukng	Kebotn	Uratn	Bengkar	River
Tepulang	125,953	158,691	75,007	151,412	13,437	157,449	38,786
Benung	93,346	71,408	88,480	160,612	100,389	392,288	259,805
Dingin	42,109	138,473	70,169	173,446	210,078	352,693	338,677

3.10.3.1 Direct Use Value for Tepulang Village

At the Tepulang Village, the average direct use value per household per year is 28,829,401.00 rupiah. The value will be worth about $3,203.267 per year with the currency conversion of 9000 rupiah per U.S. dollar. The total direct use value for the village is U.S. $205,009.10 annually. The total direct use value for the village is calculated by multiplying the average yield per household to the total population of the village. The total direct use value per village divided by the total village area will estimate the total direct use value per village per hectare per year. The total direct use value per hectare per year for the Tepulang Village is 166.032 rupiah (U.S. $0.018 per hectare per year).

3.10.3.2 Direct Use Value for the Benung Village

At the Benung Village, the average total direct use value per household per year is 46,653,108 rupiahs or about U.S. $ 5,183.68. The total direct use value for Benung Village is U.S. $ 279,918.60 annually. The total direct use value for Benung Village per hectare per year is 124.751 rupiahs or U.S. $ 0.014/hectare/year.

3.10.3.3 Direct Use Value for the Dingin Village

The Dingin Village has an average total direct use value of 29,458,748.00 rupiahs per year (U.S. $3,273.20 per year). The total direct use value for the village is U.S. $762,654.3 annually. The total direct use value for the Dingin Village per hectare per year will be 460.235 rupiah (U.S. $0.051 per hectare per year).

3.10.3.4 Direct Use Value for the Benuaq Dayak

The direct use value for the Benuaq Dayak per hectare per year is calculated by averaging the three villages' total direct use value. The value is 250.339 rupiahs per hectare per year (U.S. $0.028 per hectare per year).

Table 3.6 shows the summary of total direct use value calculation for three villages and the Benuaq Dayak tribe's.

Table 3.6 Summary of Total Direct Use Value at Three Villages

Village Tribe	Direct Use Value (U.S. $)
Tepulang	0.018
Benung	0.014
Dingin	0.051
Benuaq Dayak Tribe	0.028

3.11 Summary and Discussion

The three villages of the Benuaq Dayak that were used as a representation of the indigenous people appear to be a good sample. Based on the ANOVA test for their homogeneity, these villages have shown consistency of management activities and cultural practices. This fact will secure the processes of estimation of the Benuaq Dayak direct use value of their sustainable forest management.

The biodiversity richness of the Benuaq Dayak is increasing over time. Since their first use of Umaq with a diversity of 15 species of staple food plants, they have increased to a diversity of 15 old standing trees at Simpukng. The Simpukng areas are the reserve areas for individual households and are located close to the house or village. The diversity even increased in Bengkar areas. The Bengkar land use is the reserve area for the village and future generations. The diversity of Bengkar land use has reached as high as 32 species, or about nine to ten times that in the plantation area or timber concessionaire.

The Benuaq Dayak direct use value per hectare per year is 259.339 rupiahs per hectare per year (U.S. $0.028 per hectare per year). If it is compared to the agriculture plantation's direct use value of U.S. $40.96 per hectare per year (Mangunsong, 2000), it is obvious that the Benuaq Dayak made a lot less than the plantation. If it is compared to the timber concession direct use value of U.S. $377.16 (Institute Pertanian Bogor, 1999), the Benuaq Dayak still made less. The difference of direct use value between the tribe and the private company is mainly due to the different scale of investments, area to manage and the variety of plants.

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CHAPTER 4
PRESENT AND FUTURE BENUAQ DAYAK PERCEPTIONS OF NATURAL RESOURCES

4.1 A Brief Description of Indonesia and the Benuaq Dayak

4.1.1 A Brief Description of Indonesia

Indonesia is located in southeastern Asia between longitudes 95^{o} and 142^{o} east and latitudes 6^{o} north and 11^{o} south. It is an archipelago that extends 5,000 km along the equator between the Indian and the Pacific Oceans, and is made up of 13,677 islands. The climate of Indonesia is tropical with warm and humid conditions.

Indonesia is the fourth largest populated country in the world with a total population of 208, 452,952 people. The population growth rate is 1.49 percent (Factbook, 2004). Indonesia is characterized as having the most ethnically diverse population on earth, with each segment having its own language and culture.

Indonesia is recognized as a major world center for biodiversity due to its wide range of natural habitat, rich plant and animal resources, and high number of island endemics. Forest products, agriculture, livestock and fishery combined are the third largest source of revenue after manufactured products (MenegPPN/Bappenas and USAID, 1993). As of 2003, Indonesia's national GDP was U.S. $758.8 billion with a growth rate of 4.1 percent.

4.1.2 The Benuaq Dayak

The Benuaq are a sub group of the Luangan who belong to the Barito river language family and hold Hindu Kaharingan as their religion. The Hindu Kaharingan

religion practices secondary mortuary rites and shamanism curing rituals (Seeland and Schmithusen, 2002).

The tribe is stratified based on strata differences and marriage status (Seeland and Schmithusen, 2002). The highest leader in the village is considered the village head. This position is voted on by the village people and assigned officially by the government. The village leader mainly deals with economic and official activities at the village level. The traditional events of the village people and the official activities related to the traditional and cultural events are arranged by the adat leader (personal observations). The traditional adat law regulates most of the social aspects in the Benuaq Dayak tribe. A household or family in the Benuaq Dayak tribe generally consists of a married couple and their children (personal observations; Seeland and Schmithusen, 2002).

The Benuaq Dayak, in general, has an extensively cultivated, rain-fed agriculture system, supported by a variety of semi-wild plants from the surrounding forest areas (NRMP-USAID, 2000). The households use livestock as their meat and income source, along with the animals and plants that are collected from the forest areas. The dependency of the tribe on the natural resources, including the forest area, has formed special land use patterns. The land use of the Benuaq Dayak is basically a constant changing state of the forest areas to swiddens, to forest gardens, and then allowing nature to turn the areas into forest again (Seeland and Schmithusen, 2002). In general, there are five different land uses practiced by the Benuaq Dayak: *Umaq, Simpukng, Uratn, Kebotn/Dukuh,* and *Bengkar.*

4.2 Research Overview

Present and future perceptions of the Benuaq Dayak's natural resources can be expressed by estimating the intangible value of their natural resources consumption. Intangible values consist of indirect use value and non-use value resulting from forest functions including hydrology and water resource management, carbon sequestration, environmental contributions, habitat systems for wildlife, and maintaining biodiversity (McCracken and Abaza, 2000).

The indirect use value is the benefits that people take from nature that indirectly affect people's activities in terms of economics and production. The benefit would also result in life system support (McCracken and Abaza, 2000). The indirect use value for the Benuaq Dayak is estimated by using secondary data. The data of flood prevention, carbon sequestration and sedimentation prevention that has been already published will be transferred to the research (benefit transfer data). The benefit transfer data is estimated by transferring or applying the value or benefit of particular resources from previous studies to the site for which no such benefit values are available (McCracken and Abaza, 2000). Theoretically, indirect use values can be estimated by substitute products, replacement costs or preventive expenditures (Kahn, 1998).

The non-use value is the value that people benefit from nature without directly using or perceiving it. The non-use value for the Benuaq Dayak will be estimated through the option value and the existence value. The option value is the willingness of the respondent to pay an extra transportation cost to the different forest area in order to save their village forest for their future generations (McCracken and Abaza, 2000). The estimated option value result will express the village people's current and future

perceptions of their forest. Non-use value can be estimated by travel cost value, hedonic value or contingent valuation methods (McCracken and Abaza, 2000).

The existence value is a value placed on the forest area or natural resource area that is related to any actual or potential use of the good. Examples of goods include timber, wild life, and water management (McCracken and Abaza, 2000). The existence value will express the people's preferences regarding their natural resources in the future, considering their condition at the current time.

The research of the Benuaq Dayak was conducted in the West Kutai District in East Kalimantan Province, Indonesia. Three Benuaq Dayak villages—Tepulang, Benung and Dingin—were used as the research area because of the homogeneity of their ethnicity, their traditional customs and the richness of their natural resources. The data was collected using questionnaires.

4.3 Research Objectives

The objective of this chapter is to estimate the indirect use value and the non-use value of the Benuaq Dayak sustainable forest management using total economic value concepts. The results of both of the two values will be used to estimate the tribe's total economic value and will be applied as the sustainable forest management conducted by indigenous tribes in Indonesia. The specific objectives of this chapter are to:

1. Identify and quantify the indirect use value of Benuaq Dayak forest management.
2. Identify and analyze the Benuaq Dayak's perceptions of the forest resource as a basis to calculate the existence value.
3. Identify, analyze and estimate their willingness to pay transportation costs and their willingness to reduce natural resource consumption as a way to calculate option values.

4. Use the indirect use value, existence values and option values as part of the component for estimating the total economic value for Benuaq Dayak natural resource management methods.

4.4 Theoretical Framework for Indirect Use Values and Non-Use Values

Total economic value consists of direct use values and indirect use values. Non-use value includes existence value, option value, bequest value, altruistic value, and the value of ecological services (McCracken and Abaza 2000).

Indirect use values and non-use values in this research were estimated using a survey-based approach employing contingent valuation, travel cost, and replacement cost techniques. The contingent valuation model (CVM) is a direct valuation method, which involves asking respondents what they would be willing to pay for a benefit, and/or what they are willing to receive by way of compensation to tolerate the cost. The objective of CVM in this setting elicits personal valuations of increases or decreases in the quantity of some environmental goods (McCracken and Abaza 2000). CVM was used to reveal the willingness of the respondents to sacrifice current forest product consumption in order to conserve the forest for their future generations. The respondents are members of the Benuaq Dayak tribe.

The data collected were used to express the Benuaq Dayak bequest values and existence values. CVM was used to estimate the bequest value component of non-use value because it has been used successfully to evaluate the economic benefits of wetlands for both use and non-use values (Stevens, et.al. 1995). Further, Bateman and Turner (1993) reported that CVM has the potential for application to a wider range of environmental goods than any of the other monetary valuation techniques.

The travel cost technique (TCT) is an indirect valuation method which uses observed expenditures on the travel to recreational sites to estimate the benefit resulting from the money and time spent by people in getting to a site and to estimate their willingness to pay for the site's facilities or characteristics (McCracken and Abaza 2000). TCT was applied to estimate the willingness to pay for transportation costs among the Benuaq Dayak in order to conserve their forests. This data was used to estimate option values of the Benuaq Dayak.

The replacement cost technique (RCT) is an indirect valuation technique, which examines the cost of replacing or restoring a damaged asset to its original state, and uses this as a measure of the benefit of restoration (McCracken and Abaza 2000). The RCT was used to identify Benuaq Dayak forest management preferences relative to agricultural plantation or timber concession land uses.

4.5 Research Hypotheses

This study was conducted on the premise that the total economic value of Benuaq Dayak's forest management should positively impact their role in Indonesian economic development. The Benuaq Dayak tribe's total economic valuation can improve understanding of their management methods and offer insight into their economic contributions relative to other stakeholders. This can make the tribe's resource management regimes more competitive in comparison with the private companies.

The indirect use value and non-use value are usually missing in the calculation of the ordinary economic valuation. The hypotheses were:

H1: The indirect use value of the Benuaq Dayak's management is higher than private companies in the long term.

H1a: The indirect use value of the Benuaq Dayak's management is equal or less than private companies.

H2: The non-use value of the Benuaq Dayak's management is higher than private companies.

H2a: The non-use value of the Benuaq Dayak's management is equal or less than private companies.

The total economic value concept was employed to estimate the total economic values of the Benuaq Dayak's sustainable forest management. The use values were estimated through data collection of the Benuaq Dayak's daily activities. Surveys were conducted at three villages of the Benuaq Dayak on their direct use of forest products, both timber and non-timber. These data were used to identify direct use values and indirect use values.

The perception of Benuaq Dayak's sustainable forest conservation for the present and future generations was also explored. Estimates of their willingness to pay extra transportation costs to non-tribal forest areas and their willingness to sacrifice consumption of forest products were made through the direct interviews. These estimated values were used to estimate Benuaq Dayak's non-use values**.**

4.6 Methodology and Justification

4.6.1 Methodology

The survey-based methods were implemented in this research using questionnaires. Surveys were conducted at three villages of the Benuaq Dayak tribe: the Tepulang, Benung and Dingin Villages. The survey was conducted in the Indonesian

language. When the respondent was not fluent in Indonesian, local assistance helped the interviewer translate from the local language.

The questionnaire component of the survey was conducted using 25 to 50 randomly selected households from the village. The questionnaires were written in the Indonesian language. Local assistants also facilitated the interviews if the respondent did not clearly understand Indonesian. The data collection questionnaire survey process took about 20 to 30 days in each village.

The questionnaire was designed to collect individual household perceptions of use value and non-use value. The questionnaires for the use value data questioned the respondent on what kind of plants they planted at each land use, the yields for the current year, and what portion of those yields they sold to the market, both in quantities and prices. The questionnaires also questioned the respondent about how often they go to the river area, the forest and the garden. The frequencies defined the abundance yield that they receive on weekly and yearly basis.

The questionnaires for non-use value questioned the respondent's perceptions of their forest value, their preference value, and their option value. The data that were collected from the surveys were classified into components that form the total economic value methods. The questionnaire form that was used can be found in Appendix A.

The income per household, based on the land uses yields and time these products were produced, was calculated using the survey results. A simple mathematical additive was used to make the calculations.

4.6.2 Indirect Use Value

Indirect use value is a means to measure the function of forest products and the social costs that are worthless in terms of market price using the benefit transfers data methods (NRMP-USAIDa, 1996). Benefit transfers data is the transfer and application of estimates of economic benefits of particular resources from previous studies to a site for which no such benefit values are available. The transfer of benefits assumes that the value of the resources in question is the same or a similar value across the different sites (Pearce and Moran, 1994).

The indirect value is estimated by transferring the data that already existed at the surrounding area or other areas that have similar characteristics. The level of carbon sequestration in the area per hectare and the flood prevention costs are two types of data that could be transferred. These data exist from previous research and the calculations of others. These existing data used in the current research came from research areas that are similar to or close to the Kutai Barat.

For the Benuaq Dayak total economic value estimation, the benefit transfer data came from a publication of the Bogor Agriculture University published in 1999. The publication is titled *Kajian Sistem Nilai Hutan Produksi* and can be freely translated in English as *Research on Production Forest Valuating System*. The book was written based on research that was conducted on the Kalimantan and Sumatra Islands. The data that transferred to this research as part of the total economic value calculation are presented in the following sections.

4.6.3 Value for Erosion Prevention for Kalimantan Island

The erosion prevention value contained in the Bogor Agriculture University publication is prediction data using the Morgan and Finney equation. The equation is:

Sedimentation = (C*(runoff)^2*Sin (elevation)*10^-3

The calculation was estimated for 16 years, starting in 1992 and extending to 2008. Based on the average value of erosion prevention multiplied by $U.S. 1.5/year/hectare, the erosion prevention value is calculated. The erosion prevention value reported in this publication was 2,589,661 rupiahs per hectare (U.S. $287 per hectare). These data were used in this research because they come from an area that has similar characteristics.

4.6.4 Value for Carbon Sequestration for Kalimantan Island

Benefit transfer data for the carbon sequestration value for the forest area of Kalimantan Island was required in this research to express the forest function value. Data for this part of this research used existing data (Forestry Department-Bogor Agriculture University, 1999). Carbon sequestration is estimated through how much carbon dioxide (CO_2) the forest can absorb to produce oxygen (Forestry Department-Bogor Agriculture University, 1999). The carbon sequestration values used were from two different timber concession companies in Central Kalimantan. These data were taken because it was concluded that this area has similar characteristics as the Kutai Barat District. Furthermore, the data is an estimation using the photosynthetic processes approach developed by Baker (1950) in the Forestry Department of Bogor Agriculture University (1999):

4 ton H_2O + 12 ton CO_2 → 7 ton biomass + 9 ton O_2.

Based on this calculation, carbon sequestration potency for Kalimantan Island is 25,819,687.5 rupiahs per hectare per year (U.S. $2,869 per hectare per year).

4.6.5 Non-Use Value

Non-use value is the benefit that people receive from nature without directly using natural products or perceiving the value. Non-use values can be measured by travel cost demand, hedonic property values, and contingency valuation models. Non-use values in this study were measured using a contingency valuation model to estimate the option value and existence value. The contingency value is a direct valuation method that involves asking people what they are willing to pay for a benefit and/or what they are willing to receive by way of compensation to tolerate a cost. The option value is the extra payment an individual is willing to pay to ensure that one can make use of the forest or natural resource in the future. The option value is represented by the potential benefits, as opposed to the actual present use value. The existence value is a value that is placed on the forest area or natural resource area that has a relationship to any actual or potential use of the good. Examples of goods include timber, wildlife, and water management (McCracken and Abaza, 2000).

4.6.6 Option Value

To measure the option value, respondents were questioned about how much they would be willing to pay for additional transportation costs in order to conserve the goods they owned. The value of their willingness to pay was developed by giving the respondents an imaginary story that framed their future forest situation. The story was that their forest in the future has been impacted by a high rate of extractions by their village people. In order to save the forest for future generations, village members agreed

that they have to stop extracting products from their forests for 20 years in order to give it enough time to grow back to its original state. To compensate them for their needs, respondents are given choices of three existent forest locations that have three different conditions. Their first choice is a forest area that has a slightly better condition than their current forest. They would need to pay 10,000 rupiahs for transportation to get there. The second choice is a forest that is in good condition and in which most of the goods they need are easy to find. To get to the second choice area, the respondent has to pay 15,000 rupiahs for transportation. The third choice is a forest that has virgin forest conditions. All the goods that they need are there in abundance, but to get to the area, an additional 20,000 rupiahs is needed. The currency value of rupiahs to dollar is 9,000 rupiahs for every U.S. dollar.

The estimated willingness to pay for the Benuaq Dayak is calculated by adding the additional transportation costs that the households are willing to pay for the current average transportation to the forest. The average from the household level then was used to calculate a village average and averages for the three villages in the study.

4.6.7 Bequest Value

To measure the bequest value, the respondents were asked about their willingness to reduce the consumption they usually derive from the forest area. The willingness to reduce value was measured by giving the same imaginary framed story regarding future forests conditions as above. This time, instead of forbidding extraction from their forest, respondents are allowed to extract forest resources. To discern willingness to save their forests for their future generations, respondents were asked to reduce their consumption from the forest area. Choices were given to reduce consumption from 0%-25%, 50%,

75% and 100% of what they were taking currently. The value of their willingness to reduce consumption was then calculated by using household data of how much is currently taken from the Bengkar (forest) multiplied by the percentage that they are willing to give up. The data were then converted to the village averages and then to an overall average for the three villages.

4.6.8 Existence Value

Existence value was estimated by questioning respondents about their preference of how their forest would be managed and used as either a plantation area, a forest concession, or for coal mining. The definition of each land use was explained. For example, the plantation area was defined as completely converting their forest areas into one or two kinds of agricultural plants such as oil palm trees, cocoa trees and/or rubber trees. The timber concession area was defined as the area from which the company would harvest the logs with reforestations. The mining area was defined as completely converting the forest areas into gold or coal mining that would involve digging large holes in the ground. The following additional information was added: the people from the three villages can work in the company; the profit of every land use was briefly explained; and the environmental consequences were explained as well.

Benefit transfer data was used for these three choices as the values per hectare unit close to the research locations have already been established. The value of each land use includes investment costs, operation costs, and first-year profit. Benefit transfer estimates and functions from these nearby locations were used for the research sites. The choice that the respondent selected was used to calculate the average village existence value. These averages were used to arrive at an average for the three villages.

4.6.9 Benefit Transfer Data for Non-Use Value

Benefit transfer data used for existence value estimation were taken from two different sources. First, data of total economic value for concession companies were taken from Bogor Agriculture University (1999) data collected in the Central Kalimantan Province. The reported total economic value for forest concession area is 119,716,504 rupiahs per hectare per year (U.S. $13,301 per hectare per year).

The second set of data is total economic value for a plantation company from Mangunsong (2000). Mangunsong (2000) data came from a palm oil plantation and included financial, environmental, and social costs. Using a 28-year period and a 15 percent interest rate, the total economic value for financial costs is U.S. $5,191.5 per hectare per year. Environmental cost and social cost gave a negative total economic value of U.S. $5,795 per hectare per year

4.7 Indirect Use Value and Non-Use Value Results

4.7.1 Indirect Use Value Results

As already mentioned above, the Benuaq Dayak's indirect use value was estimated by employing the benefit transfer data method. The data was transferred from a publication of the Bogor Agriculture University published in 1999. The publication is titled *Kajian Sistem Nilai Hutan Produksi* and can be freely translated into English as *Research on Production Forest Valuating System.* The book was written based on research that was conducted on the Kalimantan and Sumatra Islands.

Based on the benefit transfer data results, the value for erosion prevention for the Kalimantan Island is 2,589,661 rupiahs/hectare/year (U.S. $287/hectare/year). The value

for carbon sequestration for the Kalimantan Island is 25,819,688 rupiahs/hectare/year (U.S. $2,869/hectare/year).

4.7.2 Non-use Value Results

4.7.2.1 Option Value

The option value was measured by how much the respondents were willing to pay for additional transportation costs in order to conserve the goods they owned. The number was then added to their regular transportation costs. Table 4.1 shows the individual household preference of willingness to pay an additional transportation costs to the forests.

Table 4.1 The Individual Household Preference

Factors	**Tepulang**			**Benung**			**Dingin**		
	A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Number	12	1	10	7	1	14	9	8	27
Percentage	48%	4%	40%	28%	4%	56%	20%	18%	60%

Where A = 5,000.00 to 10,000.00 rupiah

B = 11,000.00 to 15,000.00 rupiah

C = 16,000.00 to 20,000.00 rupiah

In the Tepulang Village 12 respondents, or about 48 percent of the total respondents, were willing to pay an additional 5,000 to 10,000 rupiahs for transportation to the forest. One person, or 4 percent, who took the survey was willing to pay 11,000 to 15,000 rupiah in additional costs for transportation. Ten respondents, or 40 percent, were willing to pay up to 20,000 rupiah in order to keep their forest healthy for the village's future generations.

In the Benung Village seven respondents were willing to pay between 5,000 and 10,000 rupiahs. Only one respondent was willing to pay an additional 11,000 to 15,000 rupiah. The other 14 respondents were willing to pay up to 20,000 rupiah in additional costs for transportation.

In the Dingin Village nine respondents were willing to pay an additional 5,000 to 10,000 rupiah for transportation. Another eight respondents were willing to pay between 11,000 and 15,000 rupiah. About 60 percent of the total respondents, or 27 respondents, were willing to pay up to 20,000 rupiah.

From the survey, the costs that individual households currently pay for transportation to the forest areas were calculated. The calculation was implemented by multiplying the cost for individual household transportation with the frequency of visitations to the forests areas. The estimation of the Tepulang Village's transportation cost was based upon an average of its regular transportation cost to the forest, which was 3,612,393 rupiah per year per household. On average, every household in Tepulang visited the forest areas at least four times a year. The transportation paid by the village for one year was 231,193,160 rupiah (U.S. $25,688). The willingness to pay additional costs for the transportation to the forest at the Tepulang Village and after considering the size of the village; will raise the total transportation cost to the forest, called option value, to 62,037 rupiah per hectare per year or U.S. $6.89 per hectare per year.

The Benung Village estimation of its regular total transportation to the forest was 2,919,104 rupiah per year per household. On average, every household in the Benung Village went to the forest areas at least three times a year. The village paid 157,631,616 rupiah per year (U.S. $17,515 per year). The willingness to pay additional cost for the

transportation at the Benung Village and after considering the size of the village; will raise the total transportation costs, called option value, to 41,220 rupiah per hectare per year (U.S. $4.58 per hectare per year).

The Dingin Village estimation of its regular total transportation to the forest was 475,915 rupiah per household per year. The average frequency of visitation to the forest areas at the Dingin Village is at least once a year per household per year. The village paid about 21,416 rupiah per year for transportation to the forest areas. The willingness to pay additional costs for transportation to the forest at Dingin areas will raise the total costs of transportation, called option value, to 948 rupiah per hectare year (U.S. $0.1 per hectare per year).

The average option value of the three villages will be the Benuaq Dayak tribe's option value. It is worth 34,735 rupiah per year (U.S. $3.86 per year). The table for the transportation costs and the visitation frequency per year per household to the forest areas is shown in detail in appendix C.

Table 4.2 shows the summary of the option calculations for three villages and theBenuaq Dayak tribe.

Table 4.2 Summary of the Option Value at Three Villages and the Benuaq Dayak Tribe

Village	**Option Value (U.S. $)**
Tepulang	6.89
Benung	4.58
Dingin	0.1
The Benuaq Dayak Tribe	3.86

4.7.2.2 Bequest Value

The bequest value is the measure of the willingness of the respondents to reduce the consumption of products that are usually derived from the forest area, combined with their regular annual consumption of forest products. Table 4.2 shows the research results for the individual household preferences of willingness to reduce the forest products consumption.

Table 4.3 The Willingness to Reduce the Consumption at Three Villages

Factors	**Tepulang**			**Benung**			**Dingin**		
	A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Number	2	15	7	3	12	6	5	24	12
Percentage	8%	60%	28%	12%	48%	24%	11%	53%	29%

Where A = Reduce up to 25 percent

B = Reduce from 26 to 50 percent

C = Reduce from 56 to 100 percent

According to Table 4.2, 8 percent of the total households in the Tepulang Village are willing to reduce their consumption of forest products up to 25 percent. Another 60 percent of the village's total households are willing to reduce their consumption of forest products up to 50 percent of their regular consumption. Further, 28 percent of this village's total household population is even willing to reduce their forest product consumption up to 100 percent. Regularly, the Tepulang Village consumes an average of 6,297,970 rupiah per year per household in forest products. The village consumes 403,070,092 rupiah per year (U.S. $44,785 per year). When the percentage is applied to the regular household consumption per year and after considering the size of the village,

the Tepulang Village will save at least 2,743,502 rupiah/hectare/year (U.S. $304.83/hectare/year). This number is called the bequest value.

In the Benung Village, almost 12 percent of the total households are willing to reduce their regular forest product consumption up to 25 percent. Another 48 percent of the total household population is willing to reduce their consumption up to 50 percent. Further, 24 percent of the total households are even willing to reduce their consumption up to 100 percent. Regularly, the Benung Village consumes an average of 15,691,528 rupiah worth of forest products yearly per household. The village consumes 847,342,512 rupiah per year (U.S. $94,149 per year). From the percentages above, the estimation of the Benung Village's bequest value after considering the size of the village; is 7,850,294 rupiah/hectare/year (U.S. $ 872.26/hectare/year).

In the Dingin Village, about 11 percent of the total household population is willing to reduce their regular forest product consumption up to 25 percent. Another 53 percent are willing to reduce their consumption up to 50 percent. The percentage of households that are willing to reduce their regular forest product consumption up to 100 percent is 29 percent. Regularly, the Dingin Village consumes an average of 7,837,624 rupiah worth of forest products yearly per household. The village consumes 1,826,166,496 rupiah per year (U.S. $202,907 per year). From the percentages above and after considering the size of the village, the estimation of the Dingin Village's bequest value is about 6,553 rupiah/hectare/year (U.S. $0.73/hectare/year).

The average willingness of the three villages to reduce the consumption of forest products, called bequest value for the Benuaq Dayak tribe, is 3,533.45 rupiah per year (U.S. $392.61 per year).

Table 4.4 shows summary of the bequest value calculation at three villages and the Benuaq Dayak tribe.

Table 4.4 Summary of the Bequest Value for Three Villages and the Benuaq Dayak

Village	Bequest Value (U.S. $)
Tepulang	304.83
Benung	872.26
Dingin	0.73
The Benuaq Dayak tribe	392.61

4.7.2.3 Existence Value

The existence value was estimated by questioning respondents about their preference of how their forest would be managed and used as either a plantation area, a forest concession, or for coal mining. Table 4.3 shows the individual household preferences of existence value for the three villages at the research areas. Most of the Tepulang Village households prefer their forest areas to be used as plantation areas. About 84 percent of the total households cast their preference for the plantation area. Only 4 percent prefer the timber concession area and another 4 percent prefer the mining area.

Table 4.5 Household Preferences of Existence Value for the Three Villages

Factors	Tepulang			Benung			Dingin		
	A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Number	21	1	1	15	1	1	33	5	4
Percentage	84%	4%	4%	60%	4%	4%	73%	11%	9%

Where A = Prefer plantation area

B = Prefer timber concession area

C = Prefer mining area

The benefit transfer data that will be employed into the calculation is shown in table 4.4. Table 4.4 is cited from Bogor Agriculture University (1999) and Mangunsong (2000).

Table 4.6 The Benefit Transfer Data of the TEC Value of the Three Land Uses

Land Uses	**Total Economic Value/Year (U.S. $/ha/year)**
Plantation Area	1,545
Timber Concession Area	8,554
Mining Area	7,926

Using the benefit transfer data of table 4.4, the Tepulang Village's existence value is 19,686,999.24 rupiah per hectare per year (U.S. $2,187.44 per hectare per year).

When it comes to estimating the existence value, about 60 percent of the Benung Village's households preferred their forest areas to be plantation areas. About 4 percent preferred timber concession areas and another 4 percent preferred mining areas. Using the benefit transfer data of table 4.4, the Benung Village's existence value is 16,350,533.64 rupiah per hectare per year (U.S. $1,816.73 per hectare per year).

Most of the Dingin Village's households preferred their forest areas to be plantation areas. Up to 73 percent of their households cast their preference for it. Another 11 percent of the total households preferred their forest areas to be timber Concession and 9 percent wanted mining areas. Using the benefit transfer data in table

4.4, the Dingin Village's existence value is is 30,747,519.09 rupiah per hectare per year (U.S. $3,416.39 per hectare per year)

The Benuaq Dayak tribe's average existence value for the three village is 22,261,684 rupiah per hectare per year (U.S. $2,473.52 per hectare per year).

Table 4.7 Summary of the Existence Value for the Three Villages and the Benuaq Dayak

Villages	Existence Value (U.S. $)
Tepulang	2,187.44
Benung	1,816.73
Dingin	3,416.39
The Benuaq Dayak Tribe	2,473.52

4.8 Perceptions of Current and Future Natural Resources

Te Benuaq Dayak tribe's perceptions of current and future natural resources are to a certain extent obvious. At present, as it was described in the previous chapter, the Benuaq Dayak has management practices that are sustainable and offer the tribe the possibility of getting a variety of income and yield over time.

Their willingness to pay an extra transportation cost in order to conserve their forest for their future generation was high. Their willingness to reduce the consumption of their forest products for their future generation was strong as well. This means that the tribe is very concerned about the situation of their natural resources and their future generation. This makes the calculation for the indirect use value of their natural resources for their TEV estimation reasonable.

The indirect use value of the Benuaq Dayak tribe is taken from the data that already existed. The value for erosion prevention for the Kalimantan Island is 2,589,661

rupiahs per hectare per year or U.S. $287 per hectare per year. The value for carbon sequestration for the Kalimantan Island is 25,819,687 rupiahs per hectare per year, or U.S. $2,868 per hectare per year. The indirect use value will definitely make the estimated value of the Benuaq Dayak tribe's total economic value higher than other land uses.

The Benuaq Dayak's option value of 104,205 rupiah/hectare/year, or U.S. $11.58 per hectare per year is definitely higher than the concession area's option value of U.S. $0.37 per hectare per year. The Benuaq Dayak's bequest value of 10,600,348 rupiah per hectare per year, or U.S. $1,177.82 per hectare per year is definitely higher than the plantation area's non-use value of U.S. $5,887per hectare per year and even if it is compare to the concession area's option value. The existence value of the Benuaq Dayak is 22,261,684 rupiah per hectare per year (U.S. $2,473.52 per hectare per year).

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CHAPTER 5
TOTAL ECONOMIC VALUE OF THE BENUAQ DAYAK'S NATURAL RESOURCE MANAGEMENT

5.1 A Brief Description of Indonesia and the Benuaq Dayak

5.1.1 A Brief Description of Indonesia

Indonesia is located in southeastern Asia with the geographic coordinates between longitudes 95^{o} and 142^{o} east, latitudes 6^{o} north and 11^{o} south. As an archipelagic area between the Indian Ocean and the Pacific Ocean, Indonesia has 13,677 islands and extends 5,000 km along the equator. The climate of Indonesia is tropical with warm and humid conditions.

Indonesia is the fourth largest populated country in the world with a total population of 208, 452,952 people. The population growth rate is 1.49 percent (Factbook, 2004). Indonesia is characterized as having the most ethnically diverse population on earth, with each segment having its own language and culture.

Indonesia is recognized as a major world center for biodiversity due to its wide range of natural habitat, rich plant and animal resources, and high numbers of island endemics. The forest products, agriculture, livestock and fishery combined are the third largest source of income after manufactured products (MenPPN/Bappenas and USAID, 1993). As of the year 2003, Indonesia's national GDP is U.S. $758.8 billion with the growth rate of 4.1 percent.

5.1.2 The Benuaq Dayak

The Benuaq are a subgroup of the Luangan who belong to the Barito river language family and hold Hindu Kaharingan as their religion. The Hindu Kaharingan

religion practices secondary mortuary rites and shamanism curing rituals (Seeland and Schmithusen, 2002).

The tribe is stratified based on strata differences and marriage status (Seeland and Schmithusen, 2002). The highest leader in the village is the village head that is voted on by the village people and assigned officially by the government. The village leader mainly deals with economic and official activities at the village level. The traditional affairs among the village people and the official activities related to the traditional and cultural events are usually arranged by the head of adat (personal observations). The traditional adat law regulates most of the social aspects at the Benuaq Dayak tribe. A family or household in the Benuaq Dayak tribe is generally composed of a married couple and their children (personal observations; Seeland and Schmithusen, 2002).

The Benuaq Dayak, in general, have an extensively cultivated, rain fed agriculture system, supported by semi-wild inventories of plants from the surrounding forest areas (NRMP-USAID, 2000). Households maintain livestock as their meat and income source, along with the animals and plants that are collected from the forest areas. The dependency of the tribes on natural resources, including the forest area, has formed special land use patterns. The land use of the Benuaq Dayak is basically a constant changing state of the forest areas to swiddens cultivations, then to forest garden, and then finally letting nature turn the areas into forest again (Seeland and Schmithusen, 2002). In general, there are five different land uses known at the Benuaq Dayak: *Umaq*, *Simpukng*, *Uratn*, *Kebotn/Dukuh*, and *Bengkar*.

5.2 Research Overview

The government's different perceptions of indigenous people and private companies regarding forest management have deprived the indigenous people in Indonesia of their rights and access to the forest. The differences are mainly caused by the lack of accurate information on how much each stakeholder's management is worth. The availabilities of the economic values of the forest concession companies and the agricultural plantation companies have given those companies the best access to the forest resources. The unavailability of total economic values of indigenous peoples both in the short- and long-term has created the rejection of their existence in the forest area. Therefore, it is important that the economic values for indigenous people's forest management be quantified. The understanding of every stakeholder's economic value of their sustainable management hopefully may stimulate positive changes by the decision maker.

The Benuaq Dayak is one of the indigenous tribes in Indonesia. This tribe is known for its sustainable way of managing natural resources. Some research has shown that the Dayak tribe has maintained management practices that can give them a variety and continuity of income. These activities included shifting cultivation, hunting and collection of various forest products, small-scale handicraft productions and tourism activities (NRMP-USAID, 1996). Dove (1988) found in his research in Kalimantan that the tribal could incorporate the swidden food crops and smallholder export crops in their forest area management to meet their daily needs and consumer goods. The combination of subsistence and market-oriented agriculture has proven successful and has shared important contributions to the national income. Padoch (1992) found that the tribe not

only slashed and burned, hunted, and harvested; but, that they also manipulated and managed the animal population in ways often subtle and invisible to the scientist's and traveler's eye. Padoch and Peluso (1996) explained that the tribes have considerable variety and change in the economic activities of individual households, as well as far richer and more dynamic "agrodiversity" on the island as a whole. Thus, the tribe increases biodiversity and provides diverse and continuous sources of income for themselves and the nation. Their management involves sustenance of forest products, socio-cultural traditions, and environmentally friendly practices. In short, Benuaq Dayak management is sustainable forest management because it maintains biodiversity and also continuous sources of income. Unfortunately, the Benuaq Dayak way of management is difficult to measure in terms of economic value. The need to calculate this economic value is critical for the Benuaq Dayak's existence as it will help the Benuaq Dayak to gain the respect of the government and other stakeholders related to natural resources management. This, in turn, will hopefully lead to changes in policy that will allow continuation of the Dayak way of life

This research estimates the total economic value of the Benuaq Dayak resources management practices. The research was conducted at three different villages located in the Kutai Barat District, East Kalimantan Province, Indonesia: Tepulang, Benung, and Dingin. The Tepulang and the Benung Villages are located inside the Idaatn watershed of the upper Mahakam River. The Dingin Village is located in the Kedang Pahu watershed. The research area can only be reached by speedboat with a traveling time of about seven hours from the provincial capital of Samarinda. These three villages were

selected as the research areas because they have maintained 100 percent Benuaq Dayak ethnicity and are still using traditional customs in managing their natural resources.

5.3 Research Objectives

The overall research objective is to estimate total economic value resulting from sustainable forest management conducted by indigenous tribes in Indonesia using total economic values concepts. This value estimation can help discern Benuaq Dayak sustainable forest management economic value and make comparisons to existing economic value generated from timber concessionaire and plantation companies. The estimated total economic value may support the Benuaq Dayak tribe's efforts to gain political support from local and central governments to their role and existence in regional development.

5.4 Theoretical Framework for Total Economic Value

Total economic value incorporates actual use values plus non-use values that express the range of social economic values associated with society's use and enjoyment of the natural world. Actual use value consists of direct use values and indirect use values. Non-use value includes existence value, option value, bequest value, altruistic value, and the value of ecological services (McCracken and Abaza, 2000).

McCracken and Abaza (2000) further explain that direct use values are estimated by methods that elicit preferences by either conducting experiments or by using questionnaire-based surveys, usually using local market prices. Indirect use values and non-use values are valuations that estimate non-marketable good value. Indirect use values are estimated by eliciting preferences and observed market-based information.

Kahn (1998) suggests that two techniques can be used for measuring the value of non-market goods: 1) revealed preference approaches that can be implemented by using hedonic pricing, hedonic wage, and travel cost models, and 2) stated preference techniques that can be implemented by using contingent valuation and replacement cost models. Pearce et al. (1993) used a number of techniques such as damage costs, mitigation cost, lost production avoided, contingent valuation and the travel cost methods for estimating the total economic value of forests in Mexico.

This research combines different techniques in order to calculate total economic values for Benuaq Dayak tribal forest management. Indirect use values and non-use values were estimated using a survey-based approach employing contingent valuation, travel cost, and replacement cost techniques. The contingent valuation model (CVM) is a direct valuation method, which involves asking respondents what they would be willing to pay for a benefit, and/or what they are willing to receive by way of compensation to tolerate the cost. The objective of CVM in this setting elicits personal valuations of increases or decreases in the quantity of some environmental good (McCracken and Abaza, 2000). CVM was used to reveal the willingness of the Benuaq Dayak to sacrifice current forest product consumption in order to conserve the forest for their future generations.

The data collected was used to express the Benuaq Dayak bequest values and existence values. CVM was used to estimate the bequest value component of non-use value because it has been used successfully to value economic benefits of wetlands for both use and non-use values (Stevens et al., 1995). Further, Bateman and Turner (1993)

reported that CVM has the potential for application to a wider range of environmental goods than any of the other monetary valuation techniques.

The travel cost technique (TCT) is an indirect valuation method which uses observed expenditures on the travel to recreational sites to estimate the benefit resulting from the money and time spent by people in getting to a site and to estimate their willingness to pay for the site's facilities or characteristics (McCracken and Abaza, 2000). TCT was applied to estimate the willingness to pay for transportation costs among the Benuaq Dayak in order to conserve their forests. This data was used to estimate option values of the Benuaq Dayak.

The replacement cost technique (RCT) is an indirect valuation technique, which examines the cost of replacing or restoring a damaged asset to its original state, and uses this as a measure of the benefit of restoration (McCracken and Abaza, 2000). The RCT was used to identify Benuaq Dayak forest management preferences relative to agricultural plantation or timber concession land uses. Figure 2.1 shows the different components that lead to total valuation. Each model component is discussed in subsequent sections.

5.5 Research Hypothesis

The research study was conducted on the premise that total economic value of Benuaq Dayak' forest management should positively impact the role of the Benuaq Dayak tribes in Indonesian economic development. Benuaq Dayak tribe's total economic valuation can improve understanding of their management methods and offer insight into their economic contributions relative to other stakeholders. This can make the tribe's

resource management regimes more competitive in comparison with the private companies.

H_1: The Benuaq Dayak's total economic value from forest resource management is equal to or greater than zero.

H_1: The Benuaq Dayak's total economic value from forest resource management is zero.

5.6 Methodology and Justification

The total economic value concept was employed to estimate the total economic values of Benuaq Dayak sustainable forest management. The use values were estimated through data collection of the Benuaq Dayak's daily activities. Surveys were conducted at three villages of the Benuaq Dayak on their direct use of forest products, both timber and non-timber forest products. These data were used to identify direct use values and indirect use values.

Direct use value is estimated by calculating the amount of direct extraction from natural resources and the associated value using a market price (NRMP-USAIDa, 1996). The direct value that the Benuaq Dayak extracts from their natural resources was measured by using the survey data results. Some equations below were employed to estimate the Benuaq Dayak's TEV.

Total DUV = {Σ(timber value)+(non timber value)+(fish value)+ …+(Xn value)} – annual labor cost/hh/village

Where the annual labor cost = total labor x labor days/person x labor rate x proportional use (0.27)

The proportional use of 27 percent for traditional land –use, called customary forest management system (CFMS), was taken from SHK village monographs data from the year 2000. The percentage was calculated from the total labor days and the real traditional labor days. The net present value **(NPV) for DUV = DUV/r**, where r is the discount rate that expresses the economic situation in Indonesia over time. The common discounted rate that is usually applied by the Indonesian government or international publications is 15 percent. The direct use value estimation per village was calculated based on an average per household in the village multiplied by the total household population in the village. The use value that was used for the total economic calculation was calculated by using the average of the estimated use value data from the three villages. The formula for this calculation is:

Estimated DUV from three villages=(DUVTepulang+DUV benung+DUVDingin)/3

Indirect use value is a means to measure the function of forest products and the social costs that are worthless in terms of market price using the benefit-transfers-data methods (NRMP-USAIDa, 1996). Benefit-transfers data is the transfer and application of estimates of economic benefits of particular resources from previous studies to a site for which no such benefit values are available. The transfer of benefits assumes that the value of the resources in question is the same or a similar value across the different sites (Pearce and Moran, 1994).

The perception of Benuaq Dayak's sustainable forest conservation for the present and future generations was also explored. Estimates of their willingness to pay extra

transportation costs to non-tribal forest areas and their willingness to sacrifice consumption of forest products were made through the direct interviews. These estimated values were used to estimate Benuaq Dayak's non-use values.

Direct use values, indirect use values and non-use values were added to generate total economic values. The equation is:

$$\mathbf{TEV = DUV + IUV + OV + BV + EV}$$

Where, **TEV =** Total Economic Value,

DUV= Direct Use Value,

IUV= Indirect Use Value,

OV = Option Value,

BV= Bequest Value, and

EV= Existence Value.

Sensitivity testing using discounting and the net present value (NPV) concept was done to compare total economic value to economic values of timber concession and plantation companies. The equation that be used to test the sensitivity of the Benuaq Dayak's total economic value is:

$$\mathbf{PV = (1+r)^{-t} \times FV}$$

Where, **PV** = Present Value

r = discount rate

t = periods of discounted time

FV = Future Value

5.7 Total Economic Value Results

The estimated direct use value, indirect-use value and non-use value for the Benuaq Dayak tribe has been calculated in the previous chapters. The final results are presented at the following sections.

5.7.1 Direct Use Value

To make sure that the discussions on the direct use value are consistent with the calculation results in chapter three, the table of total direct use value of at three villages and the Dayak Benuaq's are summarized on table 5.1.

Table 5.1 Summary of Total Direct Use Value at Three Villages

Village Tribe	Direct Use Value (U.S. $)
Tepulang	0.018
Benung	0.014
Dingin	0.051
Benuaq Dayak Tribe	0.028

5.7.1.1 Direct use for Tepulang Village

In chapter 3, the calculation on estimated direct use value for Tepulang Village has been conducted. The average direct use value per household per year is 28,829,401.00 rupiah (U.S. $3,203.267). The total direct use value for the village is U.S. $205,009.10 annually. The total direct use value per hectare per year for the Tepulang Village is 166.032 rupiah (U.S. $0.018 per hectare per year).

5.7.1.2 Direct-use Value for Benung Village

At Benung Village, the average total direct use value per household per year is 46,653,108 rupiahs (U.S. $5,183.68). The total direct use value for Benung Village is U.S. $279,918.60 annually. The total direct use value for Benung Village per hectare per year is 124.751 rupiahs per hectare per year (U.S. $0.014 per hectare per year).

5.7.1.3 Direct-use Value for Dingin Village

The Dingin Village has an average total direct use value of 29,458,748.00 rupiahs (U.S. $3,273.20). The total direct use value for the village is U.S. $762,654.3 annually. The total direct use value for the Dingin Village per hectare per year will be 460.235 rupiah (U.S. $0.051 per hectare per year).

5.7.1.4 Direct-use Value for the Benuaq Dayak

The direct use value for the Benuaq Dayak per hectare per year is calculated by averaging the three villages total direct use value. The value is 250.339 rupiahs per hectare per year (U.S. $0.028 per hectare per year).

5.7.2 Indirect Use Value

The Benuaq Dayak's indirect use value was estimated employing benefit transfer data method. The data was transferred from a publication of the Bogor Agriculture University published in 1999. The publication is titled *Kajian Sistem Nilai Hutan Produksi*, which can be freely translated in English as *Research on Production Forest Valuating System*. The book was written based on research that was conducted in Kalimantan Island and Sumatra Island.

Based on the benefit transfer data results, the value for erosion prevention for Kalimantan Island is 2,589,661 rupiahs per hectare per year (U.S. $287 per hectare per

year). The value for carbon sequestration for Kalimantan Island is 25,819,687.5 rupiahs per hectare per year (U.S. $2,868.854 hectare per year).

5.7.3 Non-Use Value

Non-use value consists of option value, bequest value, and existence value. The calculation of the estimated option value, bequest value, and existence value were implemented in chapter 4. The final results are presented at the following sections.

5.7.3.1 Option Value

The calculation in chapter 4 resulted in an option value for the Tepulang Village of 62,037 rupiah per hectare per year or U.S. $ 6.89 per hectare per year. The Benung Village has an option value that worth of 41,220 rupiah per hectare per year (U.S. $ 4.58 per hectare per yea)r. The Dingin Village has an option value of 948 rupiah per hectare per year (U.S. $ 0.1 per hectare per year).

The Benuaq Dayak tribe's option value is an averaged option value of three villages. It is worth of 34,735 rupiah per hectare per year (U.S. $ 3.86 per hectare per year).

Table 5.2 shows the summary of option value calculation for three villages and the Benuaq Dayak tribe.

Table 5.2 Summary of the Option Value at Three Villages and the Benuaq Dayak Tribe

Village	Option Value (U.S. $)
Tepulang	6.89
Benung	4.58
Dingin	0.1
The Benuaq Dayak Tribe	3.86

5.7.3.2 Bequest Value

The Tepulang Village's bequest value is at least 2,743,502 rupiah per hectare per year (U.S. $ 304.83 per hectare per year). The Benung Village' bequest values are worth of 7,850,294 rupiah per hectare per year (U.S. $ 872.25 per hectare per year). The Dingin Village's bequest value is worth 6,553 rupiah per hectare per year (U.S. $ 0.73 per hectare per year). The average of three village's bequest value will be the Benuaq Dayak tribe's bequest value. It is worth of 35,3349.67 rupiah per hectare per year (U.S. $ 392.61 per hectare per year).

Table 5.3 shows summary of bequest value calculation for the three villages and the Benuaq Dayak tribe.

Table 5.3 Summary of the Bequest Value for Three Villages and the Benuaq Dayak

Village	Bequest Value (U.S. $)
Tepulang	304.83
Benung	872.26
Dingin	0.73
The Benuaq Dayak tribe	392.61

5.7.3.3 Existence Value

Based on the calculations in chapter 4, the Tepulang Village's existence value is 19,686,999.24 rupiah per hectare per year (U.S. $2,187.44 per hectare per year). The Benung Village's existence value is worth of 16,350,533.64 rupiah per hectare per year (U.S. $1,816.73 per hectare per year). The Dingin Village's existence value is worth of 30,747,519.09 rupiah per hectare per year (U.S. $3,416.39 per hectare per year). So that

the Benuaq Dayak tribe's existence value is worth of 22,261,684 rupiah per hectare per year (U.S. $2,473.52 per hectare per year).

Table 5.4 shows summary of the existence value calculations for the three villages and the Benuaq Dayak tribe.

Table 5.4 Summary of the Existence Value for the Three Villages and the Benuaq Dayak

Villages	Existence Value (U.S. $)
Tepulang	2,187.44
Benung	1,816.73
Dingin	3,416.39
The Benuaq Dayak Tribe	2,473.52

5.7.3.4 Total Economic Value

To generate the total economic value, the direct use values, indirect use values and non-use values were added together. The Benuaq Dayak tribe's total economic value will be 50,709,551 rupiah per hectare per year (U.S. $ 6,025.88 per hectare per year).

Table 5.5 shows summary of the total economic value that summing from direct use value, indirect use value, option value, bequest value, and existence value.

Table 5.5 Summary of the Total Economic Value for the Benuaq Dayak Tribe

Type of Values	Values (U.S. $)
Direct Use Value	0.028
Indirect Use Value	
Erosion Prevention	287
Carbon Sequestration	2,868.85
Non Use Value	
Option Value	3.86
Bequest Value	392.61
Existence Value	2,473.52
Total Economic Value	6,025.88

5.8 Sensitivity Test for the Benuaq Dayak's Total Economic Value

The sensitivity test using a 15 percent discount rate and periods of time of 20 year has given the future value of 829,939,763 rupiah per hectare per year (U.S. $ 98,622.79 per hectare per year). For a period of 28 years, the future value is 2,538,804,708 rupiah per hectare per year (U.S. $ 301,689.4 per hectare per year).

5.9 Summary

Results support the hypothesis that the indigenous people's management has economic value of more than zero.

5.10 References

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CHAPTER 6
THE BENUAQ DAYAK'S TOTAL ECONOMIC VALUE CONCLUSIONS AND IMPLICATIONS

6.1 Summary

The purpose of this study is to estimate the total economic value of sustainable forest management conducted by indigenous tribes in Indonesia using total economic value concepts. The tribe's total economic value is expressed by estimating the use value, indirect use value and non-use value. The study used benefit transfer and survey methods using questionnaires to estimate the tribe's total economic value. The estimated total economic value of the Benuaq Dayak is 50,709,551 rupiah per hectare per year (U.S. $ 6,025.88 per hectare per year). The fact that there is positive economic value in Benuaq Dayak resource management might create a more prominent role for the tribe at the local and national level.

The identification and quantification of the direct use value of Benuaq Dayak forest management show that the Benuaq Dayak's direct use value of 259.339 rupiahs per hectare per year (U.S. $0.028 per hectare per year) is significantly smaller than that of the agricultural plantation and the timber concession. The difference was mainly due to the scale of investments, area under management, and volume of production.

The indirect use value of the Benuaq Dayak is based on the benefit transfer data and the value for erosion prevention for the Kalimantan Island and is 2,589,661 rupiahs per hectare per year (U.S. $287 per hectare per year). The value for carbon sequestration for the Kalimantan Island is 25,819,687.5 rupiahs per hectare per year (U.S. $2,868.854 per hectare per year). The Benuaq Dayak tribe, the concession and the agricultural

plantation have shared the same data because they are located in the same environment in the eastern part of Kalimantan Island. The three land uses share the Mahakam River. In general, the area has soil types of alluvial, ultisol, inseptisol and spondosol. The average daily temperature is 27^{o}C, and the humidity ranges from 72 percent to 98 percent.

The Benuaq Dayak's non-use value consists of an option value, bequest value, and existence value. The research estimated the option value for the Banuaq Dayak to be 34,735 rupiah per hectare per year (U.S. $ 3.86 per hectare per year). The tribe's value is definitely higher than the concession area's option value of U.S. $0.37 per hectare per year. The difference is mainly due to the different method that was used, which affected the estimation of options. The bequest value of the Benuaq Dayak is 353,349.67 rupiah per hectare per year (U.S. $ 392.61 per hectare per year). The bequest value is not expressed in the agricultural plantation and timber concessionaire's total economic value. The existence value of the Benuaq Dayak tribe's is worth of 22,261,684 rupiah per hectare per year (U.S. $2,473.52 per hectare per year).

The method used in this research is total economic value concept, which consists of direct use value, indirect use value, and non-use value estimations. The method was used to try to capture all the possibilities in calculating and estimating the value of the Benuaq Dayak's sustainable forest management. The estimated total economic value of the Benuaq Dayak management may bring new perceptions to the tribe, the private companies, and the government. One of the research objectives was to strengthen the tribe's role in the local and national economic development. The strengthened roles would also bring more respect and opportunities to the tribe in their management practices. The following sections discuss possible implications of this study for the

Benuag Dayak, private industry and the Indonesian government. The discussion will also cover the predicted new perceptions of the tribe, the private companies and the government.

6.1.1 Implications for the Benuaq Dayak

Seeland and Schmithusen (2002) said that the scientific knowledge of local communities in developing countries with largely sustainable management practices has a great ecological and political value for the global environmental protection agenda. Therefore, the need to understand the conceptualization of local resource use and forest management is critical. Further, Gonner (2002) has shows that the Benuaq Dayak in Kalimantan Island has been using the forest areas for more than 300 years. The long periods of using the forests have resulted in hundreds of forest gardens consisting of rattan, rubber, and mixed fruits; swidden fields; and fallows. Gonner further shows that the Benuaq Dayak has cultivated more than 100 locally differentiated rice varieties and150 additional crops. They also extracted at least 500 wild plants and animal species from the forest. Those facts have proven that the forests have become the reservoir and medium for the tribes to practice and extend subsistence economy, including trade with various forest products. Seeland and Schmithusen (2002) concluded by stating that studying the local resources over several years reveals the strategic pattern and individual decision-making rationales. The results are substantial dynamics of frequent switching between different income sources, as well as a significant variation in the number and kind of swidden fields.

The facts described above are not meaningful if not expressed with the economic value. The Benuaq Dayak total economic value estimation will clearly bring a new

perception to the tribe. The research was trying to express the tribe's perception in economic terms. The research results have convinced the tribe that their management is not a matter of daily, weekly, monthly, and yearly harvest yields. The Benuaq Dayak believe that their sustainable management is in line with the cultural, biodiversity sensitivity and the concern over the resources for their future generation. This could all be calculated into economic terms.

Once the Benuaq Dayak's total economic value is presented to the world, the tribe will see a different attitude from the outside. Hopefully, the government will give more support and opportunities to the tribe in the local and national development processes.

6.1.2 Implications for Private Companies

When considering the total economic value, the Benuaq Dayak may have the same role and opportunities as agricultural plantations and timber concessions in the future. The agricultural plantation strategic option could be to include the Benuaq Dayak in management as a source of local labor and a supplier of some needed items, such as food and raw materials for the plantation factory. The agricultural plantation could also use the tribe as part of its advertisement programs at the national and international levels. Another option is to perceive the Benuaq Dayak management as another plantation company for such products as rubber and rattan. Timber concessions may perceive the Benuaq Dayak as a a potential partner in forest management that could include joint use of the resources where the tribe resides. There may be opportunities for timber concessions to work together with the tribe as partners in sustainable resource conservation.

6.1.3 Implications for the Government

In the past, the government regarded the indigenous people, including the Benuaq Dayak, as a threat to national unity because of their diverse and relatively independent forms of traditional governance. The government assumed that they would restrain or prevent economic and political growth, particularly those related to the natural resource management. As a result, the tribes have little formal recognition in resource allocation, management, and regulation or taxation of their natural resource management (Colfer and Resosudarmo, 2002). The estimated total economic value for the Benuaq Dayak hopefully will change the government's perception. In the future, the government will no longer identify the indigenous people as destroyers of national forest resources and trespassers on state or concession land. Further, the government will understand that the shifting and pioneer agriculture done by the indigenous people is not negatively affecting the forests. When it comes to granting the right to extract the timber from the forest areas for third parties, the government will start recognizing the tribes' rights to manage the area as well.

6.2 References

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APPENDIX A: QUESTIONAIRE FORMS

A.1 Indonesian Version.

KUESIONER UNTUK RUMAH TANGGA DI DESA

Kuesioner No _____
Nama Desa_____

Rumahtangga No._____
Tanggal_____

1. INFORMASI RUMAH TANGGA

1.Komposisi keluarga dan hubungan dengan kepala keluarga
Jumlah orang di dalam keluarga Anda yang tinggal di rumah ini? Anak_____ Total_____

1.1. Household member

Jenis Kelamin:	1	2	3	4	5	6	7	8
0= Laki-laki								
1=Perempuan								
Umur								
0= di bawah 15 th								
1= 15-18								
2= 19-30								
3= 31-40								
4= 41-50								
5= 51-60								
6= 61++								
Pendidikan								
1= tidak sekolah								
2= tdk tamat SD								
3= tamat SD								
4= tamat SMP								
5= tamat SMU								
6= Sarjana								
7= Sarjana ++								
Pekerjaan								
1= kerja kantor								
2= buruh								
3= petani								
4= pelajar/mhs								
5= Tdk bekerja								
6= lain-lain								

2. PENGHASILAN INDIVIDU DAN PENGHASILAN TOTAL KELUARGA

Bisa tidak Bapak memperkirakan berapa gaji/penghasilan yang didapat dari masing-masing anggota keluarga yang bekerja?

2.1 Total penghasilan dari kantor? _____
2.2 Total penghasilan dari ladang/kebun? _____

3. LAHAN DAN LUASNYA

3.1 Umaq : _____ hektare (di tanam/dipelihara tahun lalu [12 bulan terakhir)

No.	Tanaman *	Perkiraan luas hektar yang ditanami	Jmlh hr kerja pertahun	Jumlah panen tahun lalu [jelaskan satuan]	Bagian dari panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Beras						
2	Jagung						
3	Rempah 2						
4	Kayu bakar						
5	Buah-buahan						
6	Sayur-sayuran						
7	Umbi2an						

3.2 Simpukng : _____ hektare (di tanam/dipelihara tahun lalu/12 tahun terakhir)

No.	Tanaman *	Perkiraan luas hektar yang ditanami	Jmlh hr kerja pertahun	Jumlah panen tahun lalu [jelaskan satuan]	Bagian dari panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Buah2an						
2	Rotan						
3	Karet						
4	Aren						
5	Obat2an						
6	Kopi						
7	Kemiri						
8	Madu						
7	Kayu tua Atau lain2						

3.3. Kebotn/Dukuh : _____ hektare (di tanam/dipelihara tahun lalu/12 tahun terakhir)

No.	Tanaman	luas hektar yg ditanami	Jmlh hr kerja setahun	Jumlah panen tahun lalu	Bagian panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Rotan Pulut						
2	Pulut putih						
3	Sega						
4	Pulut						
5	Karet atau lainnya						

3.4. Uratn : _____ hektare (di tanam/dipelihara tahun lalu/12 tahun terakhir)

No.	Tanaman	luas hektar yg ditanami	Jmlh hr kerja setahun	Jumlah panen tahun lalu	Bagian panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Kayu Bangunan						
2	Kayu Bakar						
3	Bambu						
4	Umbut rotan						
5	Rebung bambu						
6	Sayur2an						
7	Lain2						

3.5. Bengkar : _____ hektare (di tanam/dipelihara tahun lalu/12 tahun terakhir)

No.	Jenis Hasil	Perkiraan luas hektar yang ditanami	Jmlh hr kerja pertahun	Jumlah panen tahun lalu [jelaskan satuan]	Bagian dari panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Kayu Meranti						
2	Kayu Bengkira						
3	Kayu Ulin						
4	Rotan alam						
5	Madu						
6	Tanaman obat						
7	Bhn upacara adat						
8	Kayu lain						
9	Gaharu/ Damar atau						
10	Binatang liar						

3.6. Sungai : _____ km

No.	Jenis Hasil	Berapa kali penang kapan	Jmlh hr kerja setahu n	Jumlah panen tahun lalu	Bagian panen yang dijual	Bag. dari panen yg dignkan sendiri	Keterangan tambahan
1	Ikan						
2	Ikan Lain						
3	Atap Rumbia						
4	Pakis						
5	Sagu						
6	Lain2						

3 Keterangan mengenai ternak untuk 12 bulan terakhir

No.	Jenis ternak	Jumlah yng dimiliki*	Jumlah yang dijual*	Jumlah yang dimakan sendiri*	Keterangan tambahan
1	babi				
2	ayam				
3	bebek				
4	kambing				
5	Lain-lain				

5. Pengeluaran Rumah tangga

5.1 Berapa jumlah uang yang dikeluarkan selama 12 bulan terakhir untuk barang barang berikut?:

Barang	Julah yang dikeluarkan
makanan	
pakaian	
obat obatan	
uang sekolah	
perjalanan	
urusan adat	
lain (jelaskan)	

6. INFORMASI MENGENAI NILAI NON-USE VALUE

6.1 Nilai keinginan untuk membayar - willingness to pay (Option Value)

Memberikan gambaran situasi kedepan bahwa hutan mereka rusak, dan untuk memperbaikinya diperlukan kesepakatan menghentikan pengambilan hasil di hutan mereka. Untuk memenuhi kebutuhan masyarakat desa akan hasil hutan, mereka diberikan pilihan tiga lokasi hutan imajinasi dengan konsekwensi perbedaan kondisi hutan (sedikit lebih baik dari hutan mereka, lebih baik, dan jauh lebih baik) dan besarnya tambahan transportasi untuk sampai ke lokasi (10.000 rupiah, 15.000 rupiah, dan 20.000 rupiah).

6.2 Nilai keinginan untuk mengurangi - willingness to sacrifice (Bequest Value)

Sekali lagi, diberikan gambaran situasi kedepan bahwa hutan mereka rusak, dan untuk memperbaikinya diperlukan kesepakatan menghentikan pengambilan hasil di hutan mereka. Untuk memenuhi kebutuhan masyarakat desa akan hasil hutan, mereka diminta mengurangi

konsumsi hasil hutan dari tingkat yang mereka ambil selama ini. Pilihannya adalah tidak mengurangi, mengurangi dengan persentasi 0-25%, 50%, 75% atau 100%.

6.3 Pilihan manajemen untuk hutan (Existence Value)

Memberikan keterangan bahwa pilihan pengelolaan yang terbaik untuk hutan mereka akan mempengaruhi nilai keberadaan hutan dalam perhitungan ekonomi total bagi hutan. Pilihan pengelolaannya adalah sebagai HPH, tambang batu bara, atau perkebunan. Keterangan mengenai konsekwensi keberadaan pengelolaan tersebut juga diberikan, seperti mereka dapat bekerja di sana, tetapi juga kemungkinan adanya perusakan lingkungan dari pengelolaan termaksud.

A.2. English Version.

KUESIONER UNTUK RUMAH TANGGA DI DESA

Kuesioner No _____
Village name_____

Household No._____
Date _____

1. HOUSEHOLD INFORMATION

1. Family composition and relationship to the household
How many people are there living in your house right now? Number of children _____
Total number_____

1.1. Household members

Gender:	1	2	3	4	5	6	7	8
0= Male								
1= Female								
Age:								
0= under 15 th								
1= 15-18								
2= 19-30								
3= 31-40								
4= 41-50								
5= 51-60								
6= 61++								
Education:								
1= No education								
2= Did not finish elementary								
3= Finished elementary								
4= Finished middle school								
5= Finished high school								
6= College degree								
7= Graduate school/other								
Occupation:								
1= Work in office/govt.								
2= Labour								
3= Farmer								
4= Student								
5= Unemployed								
6= Other								

2. INDIVIDUAL INCOME AND TOTAL INCOME
Can you estimate the income of each household member that has a job?

2.1 Total income from office work? _____
2.2 Total income from farming or other natural resource yield? _____

3. LAND AND ITS SIZE
3.1 Umaq : _____ Hectare (Planted/maintained in the last 12 months)

No.	Type of Vegetationvegetation	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add information
1	Rice						
2	Corn						
3	Spices						
4	Fuel wood						
5	Fruits						
6	Vegetables						
7	Roots						

3.1 Simpukng : _____ Hectare (Planted/maintained in the last 12 months)

No.	Type of Vegetatio nvegetati on	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add inform ation
1	Fruits						
2	Rattan						
3	Rubber						
4	Sugar palm						
5	Medicinal plants						
6	Coffee						
7	Candle nut						
8	Honey						
7	Constrct. Woods or other						

3.2 Kebotn/Dukuh : _____ Hectare (Planted/maintained in the last 12 months)

No.	Type of Vegetation vegetation	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add information
1	Pulut merah rattan						
2	Pulut putih rattan						
3	Sega rattan						
4	Pulut rattan						
5	Rubber or other						

3.5 Uratn : _____ Hectare (Planted/maintained in the last 12 months)

No.	Type of Vegetatio nvegetati on	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add inform ation
1	Construct i-on wood						
2	Fuel Wood						
3	Bamboo						
4	Rattan shoots						
5	Bamboo shoots						
6	Vegetable s						
7	Other						

3.6. Bengkar : _____ Hectare (Planted/maintained in the last 12 months)

No.	Type of Vegetationvegetation	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add information
1	Meranti wood						
2	Bengkirai wood						
3	Ulin wood						
4	Wild rattan						
5	Honey						
6	Medicinal plants						
7	Traditional ceremony						
8	Other type of						
9	Scented wood, saps or						
10	Wild animal						

3.7 River : _____ km

No.	Type of Vegetationvegetation	Estimated amount that was planted	Total labour per year	Total yield from last year (describe the unit)	Part of yield that was sold to the market	Part of yield that was consummed by household	Add information
1	Fish						
2	Other river						
3	Thatch roof						
4	Edible Fern						
5	Sagoo						
6	Others						

4. Livestocks information for the last 12 months

No.	Type of livestock	Number owned	Number sold	Number consumed	Add information
1	Pig				
2	Chicken				
3	Duck				
4	Goat				
5	Other				

5. HOUSE HOLD EXPENDITURES

5.1 How much money was spent for the items below during the last 12 months?

Items	Amount spent
Food	
Clothes	
Health & Medication	
Schools	
Transportation	
Traditional ceremony	
Other (describes)	

6. INFORMATION FOR NON-USE VALUE

6.1 Willingness to pay additional transportation (Option Value).

The village people were told a story regarding the future of their forest, in which the forest had been impacted by a high rate of extractions by their village people. In order to save the forest for future generations, village members agreed that they have to stop extracting products from their forests for 20 years in order to give it enough time to grow back to its original state. To compensate them for their needs, respondents are given a choice of three existent forest locations that have three different conditions. Their first choice is a forest area that has a slightly better condition than their current forest. They would need to pay 10,000 rupiahs for transportation to get there. The second choice is a forest that is in good condition and in which most of the goods they need are easy to find. To get to the second choice area, the respondent has to pay 15,000 rupiahs for transportation. The third choice is a forest that has virgin forest conditions. All the goods that they need are there in abundance, but to get to the area, an additional 20,000 rupiahs is needed. The currency value of rupiahs to dollar is 9,000 rupiahs for every U.S. dollar.

6.2 Willingness to reduce forest products consumption (Bequest Value).

The village people were given the same imaginary framed story regarding future forests conditions as above. This time, instead of forbidding extraction from their forest, respondents are allowed to extract forest resources. To discern willingness to save their forests for their future generations, respondents were asked to reduce their consumption from the forest area. Choices were given to reduce consumption from 0%-25%, 50%, 75% and 100% of what they were taking currently. The value of their willingness to

reduce consumption was then calculated by using household data of how much is currently taken from the Bengkar (forest) multiplied by the percentage that they are willing to give up.

6.3 The choices of management for their forests to be calculated (Existence Value)

Existence value was estimated by questioning respondents about their preference of how their forest would be managed and used as either a plantation area, a forest concession, or for coal mining. The definition of each land use was explained. For example, the plantation area was defined as completely converting their forest areas into one or two kinds of agricultural plants such as oil palm trees, cocoa trees and/or rubber trees. The timber concession area was defined as the area from which the company would harvest the logs with reforestations. The mining area was defined as completely converting the forest areas into gold or coal mining that would involve digging large holes in the ground. The following additional information was added: the people from the three villages can work in the company; the profit of every land use was briefly explained; and the environmental consequences were explained as well.

APPENDIX B: TABLE OF DIRECT USE VALUE OF EVERY LAND USE BY THE BENUAQ DAYAK

B.1. Direct Use Value at Tepulang Village

No.	Livestock	Umaq	Simpukng	Kebotn	Uratn	Bengkar	River
1.	3514000	15000000	450000	4916704	0	0	
2.	8464000	2373367	542500	0	0	2666250	5860770
3.	8068000	6224490	2504048	8950044	0	1320000	33130
4.	3554000	9356571	1144000	13166550	0	2393500	96024
5.	500000	964000	0	13605435	0	0	109652
6.	11306000	6234286	2126072	69150	0	3260000	3820416
7.	1400000	15164571	0	0	0	550000	0
8.	468000	0	1170000	140100	20900	175000	0
9.	3836000	3098000	1050000	150300	3380012	440000	0
10.	268000	3032000	652500	0	5	9000	0
11.	4688000	16656163	2858750	0	54043	2627500	390547
12.	0	0	0	0	0	0	0
13.	5502000	18918878	840000	0	367163	660000	832208
14.	13306000	1629176	1552500	13417050	520015	0	3786792
15.	3494000	0	500000	0	520016	0	0
16.	9312000	2725078	3490500	13166550	1215692	3500000	9556274
17.	3818000	7273469	1061270,67	0	11	2915000	225030
18.	5198000	1528163	1000000	19506	1	330000	0
19.	78000	5090714	0	21944250	52103	120000	406075
20.	11734000	15764082	650000	1165216	15	3310000	0
21.	2636000	0	5532500	0	4524043	2250000	2125526
22.	7198000	5933714	5400000	4202	52157	102000	2197536
23.	10200000	7853429	25095000	35002000	99862	87846005	950182
24.	4300000	9696082	13325000	26251500	6340	555000	3480572
25.	3111000	4174776	4062500	0	6000	42420000	5000

B.2. Direct Use Value at the Benung Village

No.	Livestock	Umaq	Simpukng	Kebotn	Uratn	Bengkar	River
1.	8572000	4931429	3165333,33	37589833	270000	52038500	3253979
2.	3156000	1691980	8065000	24265117	50000	2790000	140035
3.	3028000	3769694	3712000	41139450	144000	770000	36100824
4.	6280000	2382980	650000	47653675	0	172500	607581
5.	5718000	3703959	2809500	32488481	418200	36000000	455054
6.	13720000	3170969	2333500	33316043	151000	350000	24006
7.	1592000	9768000	2450000	27432571	65000	1103000	2322743
8.	3020000	4901429	2250000	7190529	2210000	97680000	4253067
9.	9006000	3193469	853000	15738082	133640	1610000	20502
10.	2701000	3959429	5747500	7929934	125000	162000	0
11.	1125000	3428980	2902500	33331482	50000	248200	864216
12.	2808000	2751429	1037500	2751429	60000	0	324324
13.	3552000	2667000	2186000	30447249	419000	880000	813108
14.	112000	2815224	8809500	50443807	1540000	1650000	3515540
15.	4338000	1178980	7222500	5692995	140400	850000	6588108
16.	1106000	1336980	0	60969623	389428,571	97200000	621108
17.	1892000	2206714	1233500	20414495	64800	60000	1296324
18.	3528000	1036980	1592500	9462156	54000	95600000	192048000
19.	4243000	925714	3562500	50681106	220000	840000	0
20.	0	16200	9085000	37114729	50000	330000	1315162
21.	681003	1396380	2787500	20714448	100000	12000	785898,5
22.	2854000	846735	1945000	21840545	97200	800000	47503
23.	1236000	2835469	2325000	292729952	373500	880000	1395324
24.	1426000	5154469	2822000	89575463	824000	234000	1427324
25.	7652000	1336949	8127500	97536224	149600	28000	1584851

B.3. Direct Use Value at the Dingin Village

No.	Livestock	Umaq	Simpukng	Kebotn	Uratn	Bengkar	River
1.	2046000	663980	3052000	12665000	4328400	2167700	6361500
2.	454000	1158500	2850000	4032400	657400	0	1231000
3.	744000	3508980	2222000	5110800	1814800	0	2346500
4.	350000	423735	660000	2445000	160000	29160	2867000
5.	1000000	0	0	4960000	1477800	0	122000
6.	1270000	558135	0	6010000	634500	2350000	17964000
7.	53000	456600	1330000	8212500	644200	0	10275000
8.	964000	2938959	0	9500000	15000	2338400	28674000
9.	192000	0	0	161500	24000	14400	471500
10.	970000	52898	1445000	16775000	218000	1465040	11342000
11.	1846000	1005969	0	0	892400	2300000	810000
12.	1234000	595102	805000	2480000	880000	162000	8838000
13.	2884000	4952857	505000	8625000	2003000	2685400	4252500
14.	1157000	50000	1392000	14650000	869000	54000	1699500
15.	780000	528980	0	1481000	20174000	0	11340000
16.	0	93200	675000	0	2692000	34560000	715500
17.	1254000	1949160	0	0	2255000	259200000	567000
18.	1486000	686980	0	0	3151000	3603000	194850000
19.	2619000	1890090	125000	5700000	1150000	1607000	6000
20.	792000	0	645000	3175000	65000	381000	564000
21.	1318001	3382470	952000	3355000	12065000	3538000	1393000
22.	490000	511592	0	70000	3322000	7200	45000
23.	640000	2232429	1797000	6150000	2560043	1440000	1647000
24.	0	0	350000	0	154286	0	0
25.	2610000	900000	1337000	5940000	1560000	4800	627750
26.	1000000	0	0	0	492000	19200	0
27.	0	0	0	0	240000	440000	180000
28.	74000	0	0	0	494000	86400	5778000
29.	806000	0	50000	0	57600	7000	846000
30.	3466000	2284800	0	792000	3675000	521000	636000
31.	0	1254898	0	0	2446600	0	96000
32.	280000	100000	0	0	0	43200	708750
33.	140000	264490	1412500	14375000	0	24000	708750
34.	1036000	1711960	1197500	2445000	121800	725000	860000
35.	1751000	3063980	1955000	7195000	2211000	5000000	2889000
36.	500000	372490	2358000	4750000	576000	124400	45000
37.	1175000	1039980	30729000	8750000	578400	1040800	2543000
38.	619800	93420000	0	0	278400	140000	1417500
39.	188000	308694	0	0	3559200	3750000	1026000
40.	1610000	2709980	0	1257500	22039600	7020000	923000
41.	316000	2590919	1642500	2808500	10350000	6745000	1242000
42.	0	90000	3640000	7195000	994600	0	0

No.	Livestock	Umaq	Simpukng	Kebotn	Uratn	Bengkar	River
43.	1566000	659980	3820000	445000	1296000	6100000	6075000
44.	388000	0	2822000	1222500	1000800	0	810000
45.	40000	60000	400000	712500	639200	3000000	2883000

B.4. Summary per Village

Land use	Tepulang	Avrg/hh	Benung	Avrg/hh	Dingin	Avrg/hh
Livestock	125953300	5038120	93346003	3733840	42108801	035571
Umaq	158691008	6347640	71407538	2856302	138472780	3771173
Simpukng	75007141	3000286	87674333	3506973	70168500	1559300
Kebotn	151440703	6057628	160612275	6424491	173446200	3854360
Uratn	10818376	432735	8098769	311491	114817029	2551490
Bengkar	157449255	6297970	392288200	15691528	352693100	7837624
River	28798384	1151935	259804582	10392183	338676750	7526150
Total	708157866	28326315	1073231700	42916808	1230383160	27341848

APPENDIX C: TABLE OF TRANSPORTATION COST AND VISITATION FREQUENCY

No.	Tepulang			Benung			Dingin		
	Times	**Price**	**WTP**	**Times**	**Price**	**WTP**	**Times**	**Price**	**WTP**
1.	0	0	5000	7	7512400	20000	4	2763378	5000
2.	0	0	20000	7	7512400	5000	0	0	20000
3.	12	11818080	0	7	7512400	5000	0	0	15000
4.	0	0	5000	1.5	1609800	20000	0	0	15000
5.	0	0	20000	0	0	0	0	0	15000
6.	6	5909040	5000	0	0	5000	0	0	20000
7.	5	4924200	0	0	0	0	0	0	20000
8.	1.5	1477260	5000	4	4292800	5000	2.5	1727111	5000
9.	3	2954520	5000	9	9658800	0	0	0	20000
10.	0	0	5000	0	0	20000	1	690844.4	20000
11.	1.5	1477260	5000	0.5	536600	0	1	690844.4	20000
12.	0	0	5000	0	0	20000	0	0	20000
13.	6	5909040	5000	8	8585600	5000	3.5	2417956	20000
14.	6	5909040	5000	1.5	1609800	0	0	0	5000
15.	0	0	20000	0	0	20000	0	0	20000
16.	8	7878720	5000	0	0	20000	0	0	20000
17.	3	2954520	20000	0	0	20000	0	0	20000
18.	3	2954520	20000	2	2146400	20000	2	1381689	20000
19.	1.5	1477260	20000	1	1073200	20000	1	690844.4	20000
20.	4	3939360	20000	3	3219600	5000	2	1381689	5000
21.	20	19696800	20000	0	0	20000	3	2072533	5000
22.	0.2	196968	20000	7	7512400	20000	0	0	20000
23.	6	5909040	20000	8	8585600	15000	0	0	20000
24.	5	4924200	15000	1.5	1609800	20000	0	0	20000
25.	0	0	5000	0	0	5000	0	0	20000
26.							0	0	20000
27.							4	2763378	20000
28.							0	0	5000
29.							0	0	20000
30.							1.5	1036267	15000

31.							0	0	5000
32.							0	0	5000
33.							0	0	20000
34.							0	0	5000
35.							0	0	15000
36.							1	690844.4	20000
37.							1	690844.4	20000
38.							0	0	15000
39.							0	0	20000
40.							2	1381689	20000
41.							1.5	1036267	15000
42.							0	0	20000
43.							0	0	0
44.							0	0	0
45.							0	0	20000

VITA

Indah Dianti Kusuma was born in Jakarta, Indonesia, on December 07, 1963. She graduated from High School 6 Jakarta, Indonesia, in May 1983. She received a Bachelor of Science degree in forest management in1988 from Bogor Agriculture University in Indonesia. She has worked at Indonesia's National Development Planning Agency as a planner since 1988. In 1996, Indah began working on a master's degree at the School of Forestry and Environmental Studies at Yale University, funded by the International Tropical Timber Organization. She received a Master of Science degree in forest science in 1998. In 2000, Indah continued her studies at the LSU School of Renewable Natural Resources, where she is currently a candidate for the degree of Doctor of Philosophy.