

**Trends in forest ownership, forest resources
tenure and institutional arrangements:
are they contributing to better forest
management and poverty reduction?**

Case studies from Indonesia

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Summary

This paper has been prepared for the Food and Agriculture Organization of the United Nations workshop on Trends in Forest Ownership, Forest Resources Tenure and Institutional Arrangements: Are they contributing to better forest management and poverty reduction?, which was held in Bangkok, from 17 to 21 October 2005. It presents case studies from Indonesia.

Since 2001, the Nature Conservancy (TNC) has been developing collaborative management models as a forest management approach in two sites in Indonesia. Forest ownership, tenure and institutional arrangements with the Ministry of Forestry and forest concessionaires are key components of the collaborative management approach.

This paper is comprised of four sections. The first section describes the environmental, socio-economic and political contexts in which TNC and its partners operate in Indonesia.

The second section summarizes the use of collaborative management as a forest management approach and describes TNC's collaborative management initiatives in the Segah watershed in East Kalimantan and Lore Lindu National Park in Central Sulawesi, including descriptions of the project areas and forest management systems employed at each site.

The third section provides an assessment of the socio-economic and ecological health of the rural communities in the project areas in relation to their associated land-use and forest tenure systems.

The fourth section summarizes the lessons learned to date from the two case studies and provides a discussion of the effectiveness of collaborative management as a forest management approach and means of poverty alleviation. The section concludes with a list of recommendations for the way forward.

Background on forest resources ownership and trends towards community management in Indonesia

Tropical forests are important for their abilities to protect genetic diversity (IUCN, 1980), and provide for the livelihoods of rural communities (WCED, 1987). However, these forests are quickly disappearing, and community participation in managing these areas is a critical component in ensuring that they survive in the future (WCFSD, 1999). This is especially true for biologically diverse forests located outside of established protected areas. Conservation cannot succeed unless it is linked to economic opportunities and investments targeted at those whose pursuit of livelihood threatens the viability of the conservation area. The Biodiversity Plan for Indonesia (Ministry of National Development Planning/National Development Planning Agency, 1993) provides clear support for community-based forest management as one of the means whereby communities can play a critical role in the planning and management of forested areas.

FOREST TENURE

Following a legal tradition introduced by the Netherlands and modified by the Basic Forestry Law of 1967 (UU 5/1967), all forests in Indonesia, whether on public or private lands, are subject to the jurisdiction of the Ministry of Forests (Colchester, 2004).

The Ministry of Forests has the responsibility to determine which parts of Indonesia are forests and assign them to the category of forest areas (*kawasan hutan*), zone all these forest areas into conservation, protection or production forests and then determine which areas are rights forests and which are State forest areas through the process of gazettelement. Following gazettelement, the ministry then has the authority to lease concessions within State forest areas to individuals, private

companies, cooperatives and State-owned enterprises. Concessionaires, in turn, then have the responsibility to survey, delineate and gazette their concessions (Colchester, 2004).

Gazettement

According to government statistics and data furnished by the World Agroforestry Centre (ICRAF), of the 122 million ha of Indonesia currently assigned as forest areas, only some 16 percent (i.e., some 19 million ha) have so far been through the process of gazettement (Colchester, 2004).

Procedures for gazetted State forest areas require concessionaires – subject to the approval of local government, local forestry officials and communities – to delineate, demarcate and register the boundaries of their concessions to ensure that they do not contradict provincial land-use plans, overlap protection and conservation forests or overlap customary areas. According to ICRAF, data currently available from the Ministry of Forests indicate that only 47 of the approximately 600 logging concessions issued to date have fully defined their boundaries, representing only 7 percent of production forests (Colchester, 2004).

National parks

The Indonesian law on Conservation of Biological Resources (No. 5., 1990) states that people should not live inside the boundaries of the country's national parks. Given that most of Indonesia's national parks were overlaid on existing land-use systems and drawn up without the input of the communities most affected by the creation of these areas, conflict in these parks is almost inevitable. Impoverished communities find it very difficult to bear the full opportunity costs of setting aside for conservation the lands that they depend on for a portion of their livelihood (Jessup, 2001), which often leads to encroachment and degradation of national park resources through illegal extraction and conversion. Weak enforcement of park boundaries has led to the creation of numerous "paper parks" in Indonesia, where legal tenure and right to the land are ignored with little consequence.

COMMUNITY-LEVEL FOREST MANAGEMENT

Small rural communities have existed in and around forested areas in Indonesia since prehistoric times. Over the centuries, complex societies evolved with sophisticated relationships to the natural world. Over time, societal values developed that not only enabled individuals and communities to survive, but also allowed them to do so on a sustainable basis. Sustainable practices became common practice and were eventually institutionalized as traditional law, or Adat. Throughout Indonesia, Adat forms the basis for forest tenure by traditional communities that are dependent on the sustainable exploitation of natural resources for their livelihoods.

Basic principles of Adat

Adat is a set of traditional laws that regulate nearly all aspects of life in the community, and are not necessarily restricted to natural resource use. In many societies with a long history and presence in forested areas, such as the Dayak groups in Berau Regency, resource-based Adat has a clearly defined purpose. One definition of resource-based Adat that has been developed through previous studies is as follows:

"The protection role and use of communal forests is based on balanced conservation and use of natural resources considering cultural conditions, economy and equal distribution, and the well-being of present and future generations" (Deschamps, 2000).

Formulation of rules and regulations

Adat regulations are laws created by the community and administered by a local council of Adat elders. These regulations include both traditional and legal laws, and control the rights, responsibilities and legal sanctions of people residing inside and outside of the host community.

Rights of ownership and use

The extraction of forest products from the traditional use area is restricted to residents of the host community. Although private landholdings are not permitted in the forest, individuals may lay claim (hak milik) for the use of land, or even specific trees, within the area with permission from the appropriate representative. Often, this right can be passed along to family members or traded/sold to

other members of the same village. In the case of dry-field gardens, the right of use may be taken away from the user and redistributed among other residents of the host community, at the discretion of the Adat council, should the area remain unused for an extended period.

Implementation and jurisdiction

Adat details rights and responsibilities with regards to resource extraction. These are based on the principle that residents have equal rights to a healthy environment, namely to use and protect the community forest and participate in the planning, implementation and planning process. It also defines the size, location, area boundaries and harvest locations of forest products.

Amendments to Adat

Amendments to Adat must go through the Adat council before being approved. Because the specific rules and regulations regarding Adat are developed by the residents of the host community, there is no need to seek outside approval for the plan unless it involves major expansion of the land base. However, before changes to the Adat are made, extensive discussions of the nature and need for the change must be held before an Adat council makes a decision.

THE IMPACTS OF THE DECENTRALIZATION PROCESS ON NATURAL RESOURCES MANAGEMENT AND GOVERNANCE

The World Commission on Forests and Sustainable Development (WCFSD) identifies the challenge to decentralization as forming agreement on new roles among communities, the State and the private sector to issue and ensure the security of adequate and equitable rights (WCFSD, 1999). In order to achieve a workable and sustainable partnership approach, a certain level of decentralization in the existing management structure must take place. Although remaining parts of larger, provincial or national systems, individual sites must be endowed with the ability to form partnerships with local stakeholders, and to empower these partnerships with decision-making abilities as well as the institutional and financial resources required to carry them out.

Since the downfall of President Suharto in 1998, the Indonesian government has been facing mounting pressure domestically and internationally to take action to implement decentralization, but progress is slow and not all policy reforms in process are necessarily good news for forests.

Although greater accountability by both the government and the private sector has resulted from a freer political atmosphere, efforts to prevent the worst abuses of corporate power have had limited success. Longstanding problems of unclear land tenure rights have come to the forefront as a result of weakening central power. Indonesia's progress toward a new system of regional autonomy and continuing political turmoil has made it difficult for the country to meet commitments to policy reforms in the forestry sector, and regional governments have promoted intensified exploitation of forest resources as a means of generating short-term revenue in many areas.

The following sections summarize some of the most relevant issues related to decentralization of the forestry sector in Indonesia.

Governance issues

Illegal logging has been an institutionalized practice in Indonesia for decades. Suharto's New Order regime derived economic benefits from forest exploitation, but it also used the allocation of forest concessions to gain political support and to fund off-the-books projects. The degree to which the political establishment and the public administration (including national and local governments, the armed forces and political parties) in the post-Suharto era still rely on revenues from illegal forest activities is uncertain, but there is evidence indicating that these groups are still one of the causes of illegal logging in Indonesia (Obidzinski and Barr, 2003).

Processes to incorporate societal preferences about forest management – including concerns about the potential environmental harm of illegal logging – are not well developed. If citizens and administrators regard logging, even illegal logging, as beneficial to the community, they may not seek the enforcement of legislation. At an institutional level, there is evidence that local government officials in many cases are supportive of logging activities to increase local revenues and may even "legalize" illegal timber in order to capture revenues. The introduction of a more participatory and

accountable process to allocate forests to alternative land uses would contribute to better forest management in areas designated as forests, and possibly reduce social conflict.

Uncertainty surrounds the policy and legal framework for forest management in Indonesia. This problem is mainly the result of the range of social and economic interests brought to the fore by the fall of the Suharto regime and the ongoing transition process. A lack of clarity and conflicting provisions in the legislation also contribute to the problem. Government Regulation 34/2002, which provides the details for the implementation of Forestry Law 41/1999, has in effect brought about, at least on paper, a “recentralization” of decision-making on forests by clearly stating that the central government has sole authority over them and that permits issued at the regional level are no longer valid. This status is being contested by local administrations, however. In relation to the legislation itself, it is possible to define areas of absolute legality and absolute illegality, as well as grey areas in between. The existence in positive law of the definition of legality and illegality needs to be the starting point for the definition of what may be considered legal timber and legal forestry operations. Lack of full social acceptance of positive law should not be confused with a lack of positive law.

Corruption is widespread. In 2003, Transparency International ranked Indonesia as the eleventh most corrupt country in the world, jointly with Kenya. Out of 35 Indonesian public institutions, the ones most relevant to the forestry sector were ranked as follows, from least to most corrupt: armed forces, sixth; provincial governments, eighteenth; municipal governments, nineteenth; political parties, twenty-third; Ministry of Forestry, twenty-fifth; police, thirtieth; judiciary, thirty-third; and customs authority thirty-fourth. Corruption appears to be an underlying cause of illegal logging in Indonesia, but whether it is the leading cause, and how it may be related to other causes, is unclear.

Logging industry

The logging concession system in Indonesia is intended to maintain forest lands in permanent production, but poor or uncontrolled logging practices undertaken by concession holders have been a major contributor to the present rapid rate of deforestation. Logging activities are often subcontracted out to companies with little vested interest in forest management. This often leads to indiscriminate felling of trees below specified diameter limits or illegal clearing of trees outside of approved cut blocks, or on steep slopes or riverbanks. Collateral damage from poor felling practices can have an impact on wildlife habitat and movement corridors for arboreal species.

Local government

Many local governments in Indonesia have used the authority they were granted under decentralization and established greater control over the timber sector. In Berau, for example, this was accomplished through issuance of increased numbers of logging and forest conversion permits, exercising greater administrative control over timber concessions and localizing control over the forestry department by moving it from provincial to regency authority (Obidzinsky and Barr, 2003). Although Berau’s local government seized additional authority to manage forest land, it did not do so with much capacity to factor ecological and conservation considerations into its land-use planning or decision-making. Between March 1999 and January 2000, the Berau government issued 33 small-scale logging licences covering more than 11 000 ha (Obidzinsky and Barr, 2003). These permits, allowing logging on blocks as small as 100 ha, often led to clearing of land, making any kind of forest management difficult or impossible.

Communities

Over the years, there have been many examples in Indonesia in which community interest was not well represented in decision-making. By failing to account for the public interest, these narrowly based management regimes have often led to unsustainable development activities (Dutton, 2001).

Decentralization emboldened many communities to make claims to what they view as their customary use areas within timber concessionaires and national parks. However, as they lack information on their traditional land rights and possess weak negotiating skills, communities are often poorly equipped to stake their claims. In such cases, compromises are often reached that provide short-term fixes that only benefit select members of the community.

Summary of impacts of the decentralization process on natural resources management and governance

Today one of the main problems facing Indonesia's forests is conflict with local communities resulting from:

- the weak tenures accorded customary communities under the agrarian and forestry laws;
- the lack of clear regulations setting out how to recognize these weak tenures;
- the lack of regulations for recognizing rights forests, customary forests and special purpose areas;
- the inadequacies of the process in which logging concessions were gazetted and national parks created;
- confusion over new laws that have decentralized some aspects of the State's jurisdiction over lands, forests and other natural resources to district authorities;
- new laws that recognize the legitimacy and rights of local communities, which have yet to be accommodated by revised land tenure and forestry laws.

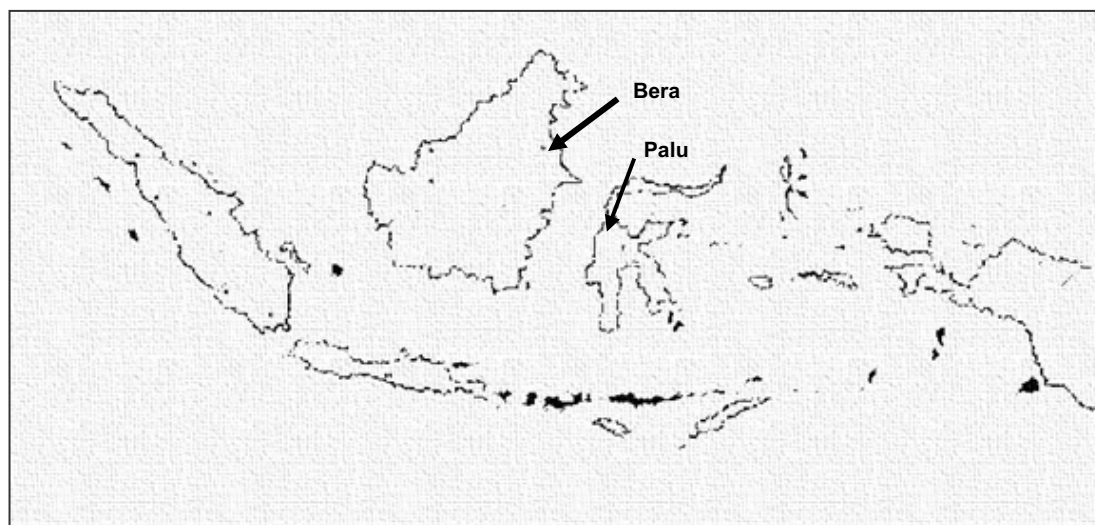
Forest resources tenure and local management arrangements – case studies in support of collaborative management in Indonesia

Recent political developments indicate a shifting of paradigm in Indonesia's natural resources management. This change coincides with the sweeping decentralization of authority that Indonesia has undertaken since 1998. This increased authority to local actors includes the management of natural and human resources, and places a much greater emphasis on bottom-up decision-making processes from one that was previously very top-down.

Given this shift, conservationists increasingly view local-level efforts targeting traditional landowning groups, local land managers and *de facto* landholders as essential components of strategies to protect biodiversity. These efforts require new mechanisms to set aside and manage effectively land for conservation within both traditional landownership systems and national land tenure regimes (Jessup, 2001). To be successful, such mechanisms must recognize traditional ownership, link permanent conservation protection with benefits from sustainable development and provide economic incentives to landholders to offset foregone revenues from extractive and other destructive uses of natural resources that might otherwise ensue.

In response to these conditions, The Nature Conservancy (TNC) has created local models for collaborative management in the Segah watershed in Berau, East Kalimantan, and Lore Lindu National Park outside Palu, Central Sulawesi.

FIGURE 1
Site map



COLLABORATIVE MANAGEMENT

The collaborative management principle evolved from an understanding that all stakeholders must feel that the system of resource management is fair and that people's concerns are adequately addressed. The fundamental issue in collaborative management is one of equitable rather than equal power sharing among stakeholders. In this regard, the concept of collaborative management differs from established notions of co-management that call for equality in authority over resources between people and the recognized resource management authority. Instead, collaborative management allows input and buy-in from communities and other stakeholders to be incorporated in the final decision, with ultimate decision-making authority retained by a single management authority – whether that be the park authority, a timber company, a government office or another

institution. This collaborative management process is undertaken with an understanding that if the concerns of local people are not represented adequately, the future of the resource cannot be considered secure regardless of the management regime in place.

Given the economic benefits derived by Indonesia from its natural resources, TNC has chosen to employ collaborative management to bring together key stakeholders, including representatives from government, the academic and private sectors and communities, to work together in achieving a common vision on how these areas should best be managed.

CASE STUDY 1: COLLABORATIVE MANAGEMENT IN THE SEGAH WATERSHED, EAST KALIMANTAN

TNC in East Kalimantan

In mid-2001, TNC launched a landscape-level conservation programme in the province of East Kalimantan. An ecoregional conservation assessment process identified the Berau and neighbouring East Kutai Regencies as containing some of the largest tracts of undisturbed lowland forest in Indonesian Borneo.

A high abundance of dipterocarp trees can be found in forests of Berau. The high potential value of these forests has led to serious threats from destructive logging practices and habitat degradation, both of which were major contributors to the catastrophic wildfires the province experienced in 1997/1998. Nearly all of Berau Regency has been parceled into concessions for timber or mining for coal and other minerals. TNC's East Kalimantan programme is particularly significant in that it was the first programme undertaken by TNC in Indonesia that focused outside a formally protected area and that was undertaken via a formal partnership with local government.

Berau Regency has a diverse ethnic mix. As in many parts of Kalimantan, many of the coastal people of Berau are Malays. Most of the upstream areas are traditionally dominated by Christian Dayaks of the Kayan and Kenyah groups who, along with the Iban, formed the legendary head-hunters of Borneo.

Dayak, meaning “upstream” or “inland”, is the collective name for the various indigenous peoples on the island of Borneo. Dayaks are divided into about 450 distinct ethnolinguistic groups with a population estimated at about 3 million spread over the four Indonesian provinces in Kalimantan, the Malaysian territories of Sabah and Sarawak and the Sultanate of Brunei Darussalam. Despite some differences, these groups share physical features, architecture, language, an oral tradition, customs, social structure, weapons, agricultural technology and a similar outlook on life (Davis, 1993). Dayak people are mainly shifting cultivators of hill rice who dwell beside Borneo's upstream rivers, occasionally in traditional longhouses, and observe customary Adat laws.

Project area

The upper Segah River in Indonesia's East Kalimantan province is remote. It takes eight hours to get there from Tanjung Redeb by long-tail boat, travelling up a river corridor flanked by walls of green and towering trees. The forest is still healthy here and provides the primary livelihoods for the five Dayak villages along the upper Segah River.

Three of the villages in the project area are ethnic Dayak Ga'ai. Part of the Kayan Dayaks, the Ga'ai have lived in this area for more than 300 years (T. Jessup, personal communication). Their primary livelihood strategy is dry rice swidden agriculture. The two neighbouring villages are Punan Dayak. The Punan are the oldest of the ethnic groups in Borneo and have long been nomadic hunter-gathers. The Punan are renowned for their prowess in hunting with blowpipes and dogs. Many Punan in Borneo maintain their traditional hunter-gatherer lifestyles, but the Punan in the upper Segah settled in villages about three generations ago and have taken up dry rice farming like their Ga'ai neighbours.

In 1990, PT. Sumalindo Lestari Jaya began operating its 100 000-ha unit IV logging concession in the upper reaches of the Segah river. Sumalindo has long been one of the more reputable logging companies in Indonesia and has worked to make logging operations in its largest logging concession, unit II, more environmentally and sociably sustainable. Nonetheless, in 2000 the five villages in and surrounding the Sumalindo unit IV concession, unhappy with the impacts of logging in their

traditional forests and the compensation they received from the logging operation, shut the concession down.

Negotiations initiated by Sumalindo eventually broke down. The villagers blocked access to the area and Sumalindo was forced to suspend operations in its unit IV concession for nearly two years. The decentralization process emboldened these communities who, despite government-approved concession rights granted to Sumalindo, clearly did not recognize the legitimacy of this tenure arrangement, especially as it overlapped with lands they laid claim to for as long as 300 years.

Collaborative management in the Segah watershed

TNC was conducting biodiversity surveys in the area during the period of conflict and found that most of the community members with whom its staff spoke indicated that they were in favour of Sumalindo resuming operations, but with more benefits provided to communities and formal assurances that impacts on traditional forests – including sacred places such as burial grounds and tree species on which the communities depend for income – would be minimized. As TNC was viewed as a neutral third party, it was asked by Sumalindo and the villagers to act a facilitator in resolving the conflict.

This use of a collaborative model led to the creation of the Segah Management Body (*Badan Pengelola Segah*), which brought together representatives from the five Dayak Ga'ai and Punan communities with Sumalindo in cooperative management of forest resources. In October 2003, an agreement was reached and logging restarted. The agreement was formally signed by the villagers, TNC and Sumalindo in June 2004. The Berau Regency government and the East Kalimantan provincial government also signed.

Agreement

The agreement resolved the standing conflict and allowed the concessionaire to resume logging activities under a commitment to move towards sustainability. It also substantially increased the benefits to communities through a compensation mechanism that boosts their proceeds from logging sixfold.

To implement the agreement, the Segah Management Body was formally established and registered as a foundation with a coordinating committee, a management committee in charge of day-to-day operations and paid and volunteer staff. The five villages each fund 5 percent of the annual costs, with Sumalindo funding the remaining 75 percent. A system to allow the Management Body to monitor forest harvesting within the concession is now being developed.

The collaborative management agreement in the Segah recognizes the ultimate decision-making and legal authority that the company holds over the concession as granted through their government-awarded logging concession. However it also acknowledges the traditional land tenure rights of communities in three ways: (1) requiring agreement on where and when logging takes place, or free and informed consent; (2) ensuring equitable distribution of logging benefits through compensation for logging in traditional lands; and (3) increasing the voice of communities in the management of forest resources.

CASE STUDY 2: COLLABORATIVE MANAGEMENT IN LORE LINDU NATIONAL PARK, CENTRAL SULAWESI

TNC in Central Sulawesi

In 1992, TNC began working with the Indonesian government in Lore Lindu National Park (LLNP). The park is home to many of Sulawesi's unique species and provides water resources to more than 300 000 people living in the area. The mountainous park harbours some of the largest unbroken tracts of forest on Sulawesi, providing essential habitat for 73 percent of the island's endemic land birds and most of its endangered mammals.

Apart from the lowland forest fringes, the general condition of habitats within LLNP is good. Forest canopy is on the whole still intact, but lower-lying areas of forest are at high risk from conversion. The economic base of Central Sulawesi is mainly agricultural, and there is little large-scale industry.

Approximately half of the population of Central Sulawesi resides in Donggala and Poso Regencies, which surround LLNP. Sixty villages containing some 40 000 people, many of whom are impoverished and landless, border the park.

A century ago, many of Sulawesi's indigenous people lived in small warring clans and practised shifting agriculture. People in the mountainous regions were strongly influenced by missionaries from the Netherlands during the last century, and Christianity has now become widespread. Today the people lead a settled lifestyle dependent on wet rice agriculture, dryland farms and tree crops. The communities located near LLNP harvest and trade a number of natural resources, particularly rattan canes for furniture.

Recent migration into Central Sulawesi by a number of economic migrants and internal refugees from ongoing religious and ethnic conflicts in Indonesia is creating social stress and has had direct impacts on local biodiversity throughout the province. Immigrants, mainly from resource-poor South Sulawesi, are swelling these numbers. Local people are typically indebted to the more economically astute immigrants. Heavy debts have occasionally led to landlessness, as local traditions do not prohibit the sale of property to pay off debts.

Project area

The planting of coffee and cocoa by local people is the biggest threat to LLNP. Because coffee and cacao deliver the largest incomes in the shortest time, farmers and traders have shown great interest in expanding cultivation of these tree crops. This practice has resulted in widespread conversion of Central Sulawesi's forests to permanent agriculture.

Commercially valuable timber species, such as dipterocarps, are not abundant in Central Sulawesi, and therefore the commercial timber market is smaller than in many other forested areas in Indonesia. However, local people harvest timber for construction and fuelwood.

Access roads leading to Palu run along the east and west boundaries of the park and directly through the Dongi-Dongi valley in the northeast corner of LLNP. Increased access resulting from road improvements often leads to greater conversion and overharvesting of forest resources.

Large budget cuts have placed Indonesia's national park system and the biodiversity within it at grave risk. LLNP is one of the largest protected areas in Sulawesi, yet in 2000 it operated on a budget of only about US\$80 000 a year, or about \$0.37 per hectare. Moreover, as power devolves locally, many of the top-down control measures that have protected parks are failing. As a result, LLNP, like many parks in Indonesia, has an ineffective law enforcement system that allows encroachment by landless people who do not accept the legitimacy of the park's boundaries. This is the case in the Dong-Dongi valley.

Dongi-Dongi encroachment

Dongi-Dongi is a wide, fertile valley that is easily accessible from the major road that runs through it. The neighbouring Palolo Valley was settled in part by local migrants from the ethnic Da'a group, who took part in government-sponsored relocation programmes from 1978 to 1982. Over the years, the government was unable to produce the land promised to these landless people. Impoverished and landless, the Da'a first encroached Dongi-Dongi valley in 1997/1998, but were convinced to move out of the area with the help of representatives from neighbouring communities who, unlike the Da'a, had traditional claims to this land.

Encroachment occurred again in 2000/2001. This time the local legislature of Donggala Regency issued a letter asking the provincial governor to locate alternative land for the villagers. The LLNP park authority also issued a strong statement condemning the encroachment. Despite these actions and the absence of any traditional claims to land by the Da'a, the encroachment has been allowed to stand, thanks in large part to the vocal support of community rights advocacy groups in Palu and Jakarta.

While initially occupying only a few hundred hectares of land, between 500 and 700 villagers were clearing forest for farming by June 2001. Land clearance continued with the support of local business interests who agreed to buy illegally logged timber and farmed goods. Estimates today are that a total of 600 households reside in the valley, and about 1 400 ha of the area has been deforested.

In 2002/2003, clearing by Dongi-Dongi settlers began to threaten the traditional lands of the neighbouring Sedoa village. In response, community members from Sedoa started to conduct

monitoring and patrolling and established a check point to assess the situation. While the situation has since quietened down, a plan for new settlements of an additional 100 households heightens the potential for horizontal conflict between landless migrants and settled communities with Adat claims to the land. Forest clearance in Dongi-Dongi has also led to instances of major flooding that further affect the long-established communities and amplify the threat of conflict.

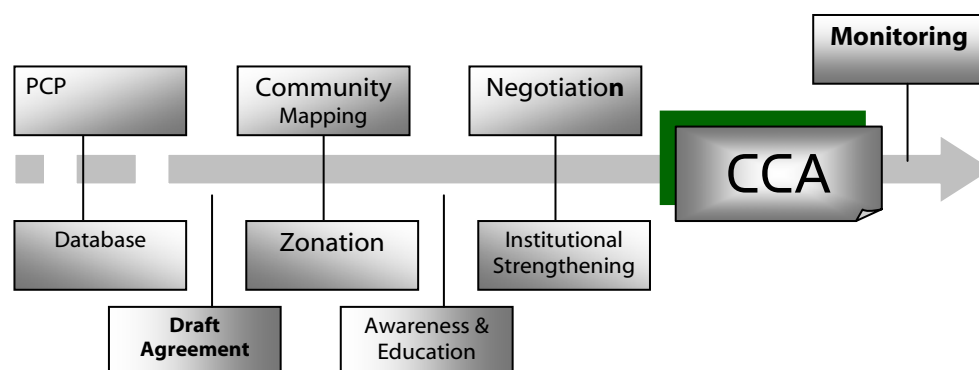
Collaborative management in LLNP

Faced with a lack of enforcement of the park's legal boundaries, TNC saw a need to pioneer mechanisms to engage the rural communities that pose direct threats to the park. A management system called site conservation planning (SCP), used by TNC throughout the world to identify threats and their sources and devise strategies for abatement, was modified for Indonesia in order to gather information on the environmental systems, stresses and strategies of greatest importance to communities. The modified methodology, renamed participatory conservation planning (PCP), approaches ecological information from the human viewpoint, relating management strategies to issues of relevance to local communities. PCP served as the basis for the development of community conservation agreements (CCAs).

Community conservation agreements

The use of CCAs was the first consistent approach developed to engage local communities in the collaborative management of LLNP. As demonstrated in Figure 2, the ten-step CCA process begins with engagement of villagers in threat assessment and abatement strategy sessions through the PCP process. This information, along with results from socio-economic surveys undertaken to identify income and resource use, is entered into a database and used to help identify land-use patterns during participatory mapping and zonation. Conservation awareness campaigns are initiated and village- and sub-district-level institutions or management bodies are formed and strengthened. Finally, community members develop conservation regulations and a zoning map, which are negotiated with park management authorities. Once the agreements are signed, communities are responsible for monitoring and enforcing them. Enforcement is often regulated through the Adat council with sanctions handed out to community members who operate outside the terms of the agreement.

FIGURE 2
The CCA process



The CCA prescribes communities with rights of access to resources, conservation responsibilities and locally applicable regulations. It also specifies the extent of community interactions with the park and mechanisms for coordination with park management. Each village-level CCA fits into the overall park zoning system. The LLNP Park Authority has embraced CCAs as a useful method for engaging communities in management. To date, 14 CCAs have been established and recognized by both the park and communities, with another 16 are currently in process.

In 2004, the Ministry of Forestry's Directorate General of Forest Protection and Nature Conservation (PHKA) recognized the success of this approach by formally adopting collaborative management scenarios with local communities as a front-line management strategy for its national parks (No. P.19/Menhut II/2004).

The CCA process legitimizes the boundaries of the national park to communities by demonstrating the park's importance in protecting traditional lands. Instead of viewing the park as locking them out of customary lands, communities are able to map out and gain access to areas of importance to them. The rest of their Adat land is viewed as being secured within the park's boundaries.

Difficulty with the CCA scenario arises with the appearance of free-riders who respect neither the park's legal boundaries nor the traditional claims of established communities, as has been the case with the Dongi-Dongi encroachment. Unless Dongi-Dongi is resolved successfully, communities engaged in CCAs around the park will begin to question why they should respect the boundaries and regulations of the park instead of emulating the profitable yet highly destructive land clearing actions of the encroachers.

Summary

Evidence from numerous national parks and timber concessions in Indonesia indicates that if local people are involved in forest management, the chance of avoiding serious encroachment and degradation of resources is greatly improved (Dutton, 2001). TNC's projects in East Kalimantan and Central Sulawesi demonstrate that in the absence of secure tenure rights, creation of management structures that are supported by customary law can foster a sense of community ownership and engender a commitment to conservation (Deschamps, 2004).

The collaborative management approach facilitated through the use of CCAs in LLNP and the Segah Management Body aim to improve the willingness of people living in these areas to commit to the long-term survival of the forest. This approach has generated strong support and significant interest both in Indonesia and the broader conservation community.

Collaborative management and economic sustainability

In 2001 and 2002, TNC conducted studies in Berau Regency and LLNP that were used to develop socio-economic and resource consumption profiles for rural communities in the project areas. These profiles provided TNC with an understanding of the demographic and economic characteristics of the communities, as well as the frequency of environment-related incidents, such as flooding and health issues.

An assessment of the profiles supports the concept that sustainable forest management, based on traditional land-use systems employing Adat, has the potential to provide social and economic benefits at a level equal to, if not superior to, other land-use systems in nearby rural areas. TNC's collaborative management approaches in East Kalimantan and Central Sulawesi embrace this concept and promote active management by local communities to develop sustainable resource exploitation and restore the balance between social benefits and ecological integrity.

In Berau, the communities that participated in the study included both Dayak and Malay villages. As discussed previously, forest-based Adat is an integral part of traditional Dayak livelihoods. Malay villages in Berau are relatively recent arrivals, and are often agricultural-based economies (primarily wet rice and cash crop); they have not developed a parallel system of Adat to manage their forest resources. As such, the communities in the Berau project area are considered representative of *forest-based* and *agro-based* systems in Berau, based on the existence and adherence (or lack thereof) to resource-based Adat.

In LLNP, the communities are comprised of households from a variety of indigenous and immigrant backgrounds, and natural resource management in project area can be considered an example of a *mixed agro/forest-based* system as most of the indigenous households focus on forest-based products while most of the immigrant households are agro-based.

The following sections provide an assessment of the socio-economic and environmental profiles in the *forest-based*, *agro-based* and *mixed* management systems, and provide the economic justification for TNC to promote sustainable forest-based systems in communities that participate in the collaborative management process.

Profiles of communities in the Berau and LLNP project areas are presented separately due to the different portfolio of agricultural and forest products that exist in the two locations. Despite these differences, parallels between the two project areas are sufficient to compare the relative effectiveness of the different land-use and resource consumption practices to provide benefit to their host communities. Environmental considerations in the two project areas are presented jointly.

SOCIO-ECONOMIC PROFILE OF RURAL COMMUNITIES IN BERAU

Agricultural producer and resource user survey

The Agricultural Producer and Resource User Survey was developed to gather primary data at the household level from rural communities in the Segah/Kelay watershed. Tanjung Redeb-based non-governmental organizations (NGOs) assisted in conducting the survey.⁵⁵

⁵⁵ Survey delivery training was provided to the surveyors on 14 May 2002 and the survey was conducted from 15 to 21 May. By using official population figures provided by the Central Bureau of Statistics, it was determined that a statistically representative sample of rural households required a minimum of 243 respondents for a 95 percent level of confidence. In total, 306 surveys were conducted in 12 rural communities.

Agricultural production

Table 1 shows that basic agricultural inputs indicate similar areas of land and weekly effort. Agro-based systems place greater emphasis on irrigated land, probably as a result of importing the rice paddy culture via Javanese migrants to the area.

TABLE 1
Household agricultural inputs: forest-based and agro-based systems

	Forest-based	Agro-based
Area of agricultural land	2.36 ha	2.14 ha
Area of irrigated land	0.08 ha	0.24 ha
Weekly level of effort	29.0 hours	27.8 hours

Source: Agricultural Producer and Resource User Survey, 2002.

Survey participants were asked to provide the annual household production of each of the nine most common cultivated crops, the unit price received for each and the percentages consumed in the household and sold/traded. As households typically produce more than one type of fruit or vegetable, they were asked to provide information only for the primary types they produced. This helped to ensure a conservative estimate.

Although rice is the primary food staple in Berau, as it is throughout most of Indonesia, wet rice agriculture (*sawah*) is not as extensive as it is in other parts of the archipelago. Soil fertility, topography and climate in Kalimantan are more conducive to dry rice agriculture (*ladang*) and, as a result, this type of agriculture is dominant in Berau. However, there are locations within Berau that are suitable for *sawah* production.

Few inland fisheries, such as freshwater ponds, cage culture ponds or paddy– fish cultures, were recorded in the study area as part of agricultural households' portfolio of production activities. Dinas Perikanan dan Perlautan has examined the possibility of developing inland fisheries in communities along the Kelay and Segah rivers, but to date little interest in developing them has been shown at the community level as natural stocks are still perceived as plentiful (V. Deschamps, personal communication, May 2002). Dinas representatives are concerned that natural stocks cannot support high levels of extraction and that alternatives should be examined. Their concerns are justifiable, given previous examples of stock depletions in larger river systems in Kalimantan including the Mahakam and Kapuas rivers. Inland fisheries have proven successful in other parts of Berau, producing 1 027.4 tonnes of fish worth more than Rp5.5 billion in 2000.

Other agricultural products require water, but do not require direct irrigation. Most of the non-irrigated agriculture production is in the form of dry rice, and the remaining products are recognized cash crops; fruit, coffee and cocoa are particularly important to the local agricultural economy.

Households in forest-based systems derived approximately Rp2.78 million (US\$324) from agricultural products (Table 2A). Most of this was consumed in the home, and about 27.8 percent was either sold or traded. Dry rice was the most important crop, both in terms of household consumption and as a cash crop (although more emphasis was placed on the former). Cocoa was the only crop that was grown specifically as a cash crop.

TABLE 2A
Agricultural production and value: forest-based systems

Product	Average annual production per agricultural household (kg)	Average total value (Rp)	Used		Sold/traded	
			%	Value	%	Value
Cocoa	36.0	238 031	1.0 %	2 467	99.0 %	235 564
Coconut	28.8	57 365	56.6 %	32 462	43.4 %	24 902
Coffee	11.9	70 363	53.3 %	37 476	46.7 %	32 886
Dry rice	641.0	1 835 791	86.8 %	1 594 015	13.2 %	241 776
Fish ponds	3.9	98 361	100.0 %	98 361	0.0 %	0
Fruit	94.4	461 115	49.2 %	229 702	50.2 %	231 413
Pepper	0.01	246	100.0 %	246	0.0 %	0
Vegetables	9.4	10 476	65.3 %	6 837	34.7 %	3 639
Wet rice	2.0	5 902	68.8 %	4 057	31.3 %	1 844
Total		2 777 650	72.2 %	2 005 623	27.8 %	772 024

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Households in agro-based systems derived approximately Rp2.23 million (US\$260) in agricultural products (Table 2B). Most of this production was sold or traded, with 42.3 percent being consumed in the home. Despite the fact that there are not many large operations in the study area, fish ponds represented the greatest source of average income. Cocoa, fruit, pepper and vegetables were also grown primarily for sale. As with households in the forest-based systems, the majority of rice crops were consumed in the home.

TABLE 2B
Agricultural production and value: agro-based systems

Product	Average annual production per agricultural household (kg)	Average total value (Rp)	Used		Sold/traded	
			%	Value	%	Value
Cocoa	10.6	78 210	0.0 %	0	100.0 %	78 218
Coconut	69.8	48 065	60.8 %	29 222	39.2 %	18 843
Coffee	6.1	34 516	81.5 %	28 124	18.5 %	6 392
Dry rice	218.9	656 613	91.6 %	601 452	8.4 %	55 161
Fish ponds	32.3	806 452	0.0 %	0	100.0 %	806 452
Fruit	230.2	361 952	33.4 %	120 870	66.6 %	241 081
Pepper	0.81	16 129	0.0 %	0	100.0 %	16 129
Vegetables	48.7	75 056	31.5 %	23 606	68.5 %	51 451
Wet rice	50.0	150 000	92.7 %	139 113	7.3 %	10 887
Total		2 226 993	42.3 %	942 387	57.7 %	1 284 614

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Livestock inventories

Livestock data were derived from the Agricultural Producer and Resource User Survey, and were cross-referenced with published data from Dinas Pertanian, Perkebunan dan Perternakan (Department of Agricultural, Plantations and Livestock). The types of livestock present in the study area included chickens, cows, ducks, goats and pigs. Survey respondents were asked the number of each type of livestock they possessed and to assess the market value of their household inventories.

Average levels of consumption were provided by Dinas Pertanian, Perkebunan dan Perternakan for each livestock type.

Households in agro-based systems placed greater emphasis on developing and maintaining livestock inventories (Table 3). The value of agro-based inventories is almost six times that of forest-based households, and represents a significant portion of total capital investment by individual households and agro-based communities. Much of the agro-based livestock inventories is cattle; agro-based livestock inventories of pigs are much smaller owing to the predominantly Muslim populations in these communities. As a result of larger overall inventories, a smaller percentage of the inventory is consumed annually than in forest-based households, although the overall value of this consumption is substantially higher.

TABLE 3
Livestock inventories: forest-based and agro-based systems

Livestock type	Average number per agricultural household		Average value of inventory (Rp)		Average value of annual consumption (Rp)	
	Forest-based	Agro-based	Forest-based	Agro-based	Forest-based	Agro-based
Chickens	7.6	11.6	187 461	264 597	151 391	213 685
Cows	0.2	1.8	387 705	5 116 129	63 088	832 501
Ducks	0.7	2.8	18 586	66 048	11 345	40 316
Goats	0.004	0.048	1 025	33 871	165	5 457
Pigs	1.4	0.1	367 459	58 065	124 510	19 675
Total Value			962 236	5 538 710	350 499	1 111 634
Annual consumption	36.4 percent	20.1 percent				

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Value of agricultural production

Table 4 compares the value of agricultural production in forest-based and agro-based systems. Agro-based systems produced a marginally higher value, owing primarily to the higher value of livestock consumption in agro-based communities. It should be noted that the consumption figure has been used in this determination as it represents that portion of the livestock inventory that contributes to household income on an annual basis. However, the importance of capital investment in agricultural production warrants further examination, and a discussion of the capital investments of forest-based and agro-based systems is provided in a later section of this case study.

TABLE 4
Value of agricultural production: forest-based and agro-based systems

Component	Annual benefit/economic value (Rp)	
	Forest-based	Agro-based
Value of agricultural products	2 777 650	2 226 993
Value of livestock consumption	350 499	1 111 634
Total value of agricultural production	3 128 149	3 338 627

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Forest products

Production levels for the 11 most common forest products in the watershed were determined by data derived from the survey. The portfolio of products was selected through discussions with TNC

staff and survey participants and review of documentation from Dinas Pertanian, Perkebunan dan Perternakan (Department of Agriculture, Plantations and Livestock), as shown in Tables 5A and 5B.

Dayak communities have traditionally relied heavily on hunting wild game as a source of food. This represents an important protein source for the people in the upper reaches of the Kelay and Segah rivers. Of greatest importance is the consumption of the bearded pig (*Sus barbatus*). According to the survey, agricultural households that hunt pig (i.e., Dayak households), consume an average of 89.2 kg of pig meat annually, or 15.4 kg per person. This estimate is very close to the 12 kg of wild meat per person consumed in Sarawak (MacKinnon *et al.*, 1996: 380). Other forms of wild game were also recorded in the survey including deer, river turtles, monkeys and civets, although other species, such as sun bear and orangutan, are also known to be consumed.

Households in forest-based systems derived approximately Rp9.08 million (US\$1 058) in forest products (Table 5A). Almost half of this value was either sold or traded, although most of the wild game gathered from the forest (i.e., meat and fish) was consumed in the home. Timber was the most important forest product in terms of value, and was sold along with gaharu (aloe wood) and honey as the most important sources of income.

TABLE 5A
Forest products and value: forest-based systems

Product	Average annual production per agricultural household (kg)	Average total value (Rp)	Used		Sold/traded	
			%	Value	%	Value
Bird nests	0.004	9 836	0.0%	0	100.0%	9 836
Damar	1.6	2 855	95.8%	2 736	4.2%	119
Fishing	164.9	1 082 898	78.8%	853 813	21.3%	230 379
Gaharu	1.0	2 324 859	0.0%	0	100.0%	2 324 859
Honey	33.0	817 725	33.3%	272 067	66.7%	545 658
Medicinal plants	0.6	902	97.3%	877	2.7%	24
Other hunting	0.5	140 328	49.3%	69 228	50.7%	71 099
Pig hunting	89.2	566 287	88.7%	502 244	11.3%	64 043
Rattan	5.2	5 338	94.2%	5 030	5.8%	307
Shrimp	0.3	6 352	100.0%	6 352	0.0%	0
Timber (m3)	10.3	4 118 668	72.2%	2 972 929	27.8%	1 145 739
Total		9 076 048	51.6%	4 685 276	48.4%	4 392 063

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Households in agro-based systems derived approximately Rp2.90 million (US\$338) in forest products (Table 5B). Timber was the most important forest product gathered, with household consumption being slightly more than that sold or traded. The remainder of the forest products had more defined roles in the household economy; they were either used or sold/traded, but not both. Shrimp, other hunting (i.e., non-pig game), medicinal plants and rattan were consumed exclusively in the home (and fish nearly so). Gaharu was the only product gathered exclusively for sale.

TABLE 5B
Forest products and value: agro-based systems

Product	Average annual production per agricultural household (kg)	Average total value (Rp)	Used		Sold/traded	
			%	Value	%	Value
Fishing	22.3	120 161	80.7%	96 930	19.3%	23 232
Shrimp	6.5	161 290	100.0%	161 290	0.0%	0
Pig hunting	0.0	0	N/A	0	N/A	0
Other hunting	0.1	8 065	100.0%	8 065	0.0%	0
Bird nests	0.0	0	N/A	0	N/A	0
Damar	0.0	0	N/A	0	N/A	0
Gaharu	0.9	427 335	0.0%	0	100.0%	427 335
Honey	0.0	0	N/A	0	N/A	0
Medicinal plants	0.5	532	100.0%	532	0.0%	0
Rattan	1.5	1 226	100.0%	1 226	0.0%	0
Timber (m3)	9.1	2 183 871	57.8%	1 261 792	42.2%	922 079
Total		2 902 480	52.7%	1 529 835	47.3%	1 372 646

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

Economic value of agricultural and forest products

Table 6 indicates that the economic benefits derived by households in forest-based communities were substantially higher (Rp5 963 090 or 95.5 percent) than those derived by agro-based households. The reason for this higher figure was the near-dependency of forest-based households on forest products, which accounted for almost three-quarters of the average household income.

TABLE 6
Summary of economic benefits: forest-based and agro-based systems

Component	Annual benefit/economic value (Rp)	
	Forest-based	Agro-based
Value of agricultural production	3 128 149 (25.6%)	3 338 627 (53.5%)
Value of forest products	9 076 048 (74.4%)	2 902 480 (46.5%)
Total value of production	12 204 197	6 241 107

Note: US\$1 = Rp8 575 (June 2002). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2002.

SOCIO-ECONOMIC PROFILE OF RURAL COMMUNITIES IN LLNP

Agricultural producer and resource user survey

The Agricultural Producer and Resource User Survey was adapted to suit local conditions.⁵⁶ These adaptations included revised categories of agricultural and forest products, livestock inventories and

⁵⁶ By using official population figures provided by the Central Bureau of Statistics, it was determined that a statistically representative sample of rural households in the project area required a minimum of 263 respondents for a 95 percent level of confidence. In total, 306 surveys were conducted in 11 rural communities.

rates of consumption, as well as the addition of schistosomiasis, which is endemic to many of the small communities around the periphery of LLNP, to the list of environmental incidents.

Agricultural production

The average household in the survey utilized 1.83 ha of agricultural land. More than half of this, 0.99 ha, was irrigated for wet rice, vegetables or fish ponds. On average, the primary farm worker devoted 34.1 hours per week to agricultural activities.

The agricultural goods produced in the sub-watershed included cocoa, cloves, candlenut, coconut, coffee, dry rice, fish, fruit, pepper, vanilla, vegetables and wet rice.

Households in the survey derived approximately Rp3.21 million (US\$318) from agricultural products. Most of this production was sold or traded, with 39.3 percent being consumed in the home. Wet rice was the most important product, both for its value for consumption and as a cash crop (54.6 percent consumed and 45.4 percent sold/traded). Cocoa, cloves, candlenut and vanilla were grown exclusively as cash crops, and about two-thirds of coconut, coffee, pepper and vegetables were also sold. The remaining products – dry rice, fish and fruit – were consumed in the home.

Livestock inventories

Types of livestock present in the survey area included chickens, cows, ducks, goats, horses, pigs and water buffalo. Horses were considered only as beasts of burden and were not consumed; their inclusion in the survey was necessary to determine the overall value of livestock inventories in the survey area.

Households in the survey placed emphasis on developing and maintaining livestock inventories. On average, livestock inventories were valued at about Rp3.4 million (US\$336) per household. Cows and water buffalo represented the greatest components of the inventories in terms of value. Chickens and ducks were the most plentiful livestock types (14.9 and 3.1 animals per household, respectively).

On average, about 20.4 percent of the household livestock inventory was consumed on an annual basis. The value of this consumption was Rp683,809 (US\$67.70).

Value of agricultural production

Table 7 shows the value of agricultural production of households in the mixed forest-/agro-based systems.

TABLE 7
Value of agricultural production: mixed systems

Component	Annual benefit/economic value (Rp)
Value of agricultural products	3 209 035
Value of livestock consumption	683 808
Total value of agricultural production	3 892 843

Note: US\$1 = Rp10 100 (November 2001). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2001.

Forest products

Production levels for the nine most common forest products in the survey area were determined through the survey. The portfolio of products was selected through discussions with TNC staff and survey participants and on review of documentation from Dinas Pertanian, Perkebunan dan Perternakan (Department of Agriculture, Plantations and Livestock), and included damar, fishing, honey, medicinal plants, palm sugar, rattan, shrimp, timber and tree bark.

Households in the mixed system derived approximately Rp3.0 million (US\$293) from forest products. The majority of this, 81.6 percent, was consumed in the home and the remainder was either sold or traded. Timber was the most important forest product in terms of value. Despite 84.5

percent of timber being consumed in the home, it was also the most important source of income. Fish and damar were the only forest products harvested specifically for sale/trading. Tree bark, honey and medicinal plants were gathered primarily for consumption in the home. Shrimp, palm sugar and rattan were evenly split between home consumption and cash crops.

Economic value of agricultural and forest products

Table 8 shows the average economic contributions of agricultural production and forest products to households in the mixed forest–agro systems. Agricultural production provides a marginally greater proportion of this benefit.

TABLE 8
Summary of economic benefits: mixed systems

Component	Annual benefit/economic value (Rp)
Value of agricultural production	3 892 843 (56.8%)
Value of forest products	2 958 976 (43.2%)
Total value of production	6 851 819

Note: US\$1 = Rp10 100 (November 2001). Totals may not add up exactly owing to rounding.

Source: Agricultural Producer and Resource User Survey, 2001.

IMPACTS ON THE NATURAL ENVIRONMENT AND COMMUNITY WELL-BEING

Tropical forests are one of the world's major biomes. However, as forests continue to be cut down, converted or altered, the value of services that can be provided by the forests decreases. Once the forest is removed it will likely never revert to its original state; chances are it will be converted to ladang, rice paddies or rural residential use. As such, the economic gains that can be made through extractive practices may be higher than the value of ecosystem services in the short term. However, the loss of key ecosystem services in the long term far out-value the short-term gains of extraction, as well as increasing the risks to human well-being.

Frequency of environmental events and impacts on rural households

The study identified seven ecosystem service-related events that commonly occur in Berau and LLNP (although schistosomiasis is found only in some parts of LLNP). These are conflicts with wildlife, diarrhoea, drought, erosion, floods, forest fires and malaria. Although these are events that may appear natural, they are frequently the result of human activity, or at least amplified from their natural levels as a result thereof. Either way, the frequency of these events on the population of the watershed reflects stress on the ecosystem and affects its ability to provide services to the community. This, in turn, has direct impacts on the well-being of local residents.

Despite the economic benefits derived by both forest-based and agro-based communities in the survey, current land-use practices in the area may be having an impact on the well-being of the communities. Table 9 shows the frequencies of environmental incidents in forest-based, agro-based and mixed forest–agro communities in Berau and LLNP.

TABLE 9
Environmental incidents: forest-based, agro-based and mixed systems

Incident	Forest-based	Agro-based	Mixed
Conflicts with wildlife	10.2%	0.0%	N/A
Diarrhoea	67.2%	33.9%	41.5%
Drought	13.1%	8.1%	35.9%
Erosion	22.1%	9.7%	9.8%
Floods	91.8%	53.2%	41.2%
Forest fires	4.1%	6.5%	5.9%
Malaria	88.9%	51.6%	60.5%
Other	N/A	N/A	7.5%
Schistosomiasis ⁵⁷	N/A	N/A	4.9 percent

N/A = not applicable to survey area.

Source: Agricultural Producer and Resource User Surveys, 2001 and 2002.

Households in forest-based communities reported higher rates of incidents in all categories, with the exception of forest fires. Almost 40 percent of respondents from forest-based communities reported that their water was either somewhat dirty (36.5 percent) or very dirty (3.3 percent). In comparison, 45 percent of households in agro-based communities reported that their water was either somewhat dirty (40.0 percent) or very dirty (5.0 percent). Fewer respondents reported somewhat dirty (18.9 percent) or very dirty (1.3 percent) in the mixed system community (although the mixed system survey was conducted in a separate watershed).

In many cases, the elevated frequencies of environmental incidents experienced by forest-based communities are not the result of the activities of the communities themselves. Many of these incidents may be the result of the close proximity of forest-based communities to the front lines of environmental degradation (i.e., unsustainable timber extraction, illegal logging and the conversion of natural forests to oil-palm plantations) combined with the lack of mitigating infrastructure or services. Identifying and addressing the sources of these incidents, either from within the communities or from outside, is an important step in maintaining the balance between community health and economic prosperity.

The relationship between resource extraction and the impacts on ecosystem services and well-being is not yet understood by the majority of residents, even though it may have an effect on health in the community. Although forest-based activities appear to be profitable in an economic sense, the true costs of these activities, in terms of impacts on ecosystem services and well-being in the community, may have been overlooked for the sake of short-term financial gain. As such, the frequency of these events should be closely monitored in the future as a measure of the sustainability of the collaborative management system.

Effects of forest conversion on sedimentation

Periodic flooding of rivers and the erosion of slopes is a natural phenomenon exacerbated by human activity. An estimated 30 percent of Kalimantan is susceptible to landslides, with the most critical zones being the hill and mountain areas where forests have been cleared or partly felled (MacKinnon *et al.*, 1996: 535). Given the prevalence of shifting cultivation and forest conversion in the hill areas of Berau, there is a high chance of erosion when vegetation cover is removed, especially on steep slopes.

Studies conducted by TNC in LLNP indicate that there is strong correlation among forest clearing, increased runoff and heavier sediment loads in rivers (Widjajanto, 2001). This also appears to be the case along the Kelay and Segah rivers in Berau. Locals report that increased sediment bed loads in the rivers have resulted from elevated erosion rates in the upper catchments of these rivers, as a cumulative effect of forest conversion activities. Erosion and the loss of productive land have

⁵⁷ Schistosomiasis is endemic to many of the small communities around the periphery of LLNP.

been reported by communities along both the Kelay and Segah rivers. Anecdotal information from Dinas Perikanan dan Perlautan shows that as recently as 25 years ago it was possible to see fish on the bottom of the Kelay River in Tanjung Redeb. Today the river at this point is very murky and visibility is near zero (V. Deschamps, personal communication, May 2002).

Between 1997 and 2000, 130 145 ha of forest in Berau was converted to other uses (BFMP, 2001). Another 63 651 ha of healthy forest became disturbed forest over this same time period. The rates of conversion, and the inherent risk of increased sedimentation associated with these, pose a substantial threat to the health of the Kelay and Segah rivers.

Poor forest management and drought conditions have had a major impact on forests and plant communities, and together with the impacts of forest clearing related to logging, agriculture and resettlement, can result in forest fires of catastrophic proportions. Deforestation of land overlying coal deposits is of particular concern. Drought and forest fires in 1982/1983 affected an estimated 3.6 million ha of forest in East Kalimantan, and another million ha in neighbouring Sabah (MacKinnon *et al.*, 1996: 34). More recent fires in 1997/1998 affected an estimated 5 million ha throughout Indonesia, including 3.06 million ha in Kalimantan. The total economic value of the damage caused by the 1997/1998 fires has been conservatively estimated at US\$4.47 billion, most of which was borne by Indonesia (Glover and Jessup, 1999: 141). It has been estimated that Kalimantan loses more than 500 000 ha of forest every year (MacKinnon *et al.*, 1996: 34), indicating that the threat of forest fires in East Kalimantan remains.

Effects of deforestation on water quality, flow rates and stability of flow for agricultural systems

The forests of LLNP provide measurable benefits through the regulation of water flow rates and sediment loads. In 2001, Dinas Pekerjaan Umum, Proyek Pimpinan Irigasi estimated that the cost of maintaining 1 ha of government-sponsored irrigated land in the face of sedimentation was approximately Rp60 000 per year. The Central Sulawesi Integrated Development and Conservation Project estimated that the cost of maintaining traditionally irrigated land was approximately 15 percent of the cost of maintaining civil works, or Rp9 000/hectare. As a result, it was estimated that the annual protection value provided to irrigated systems by the forested areas of LLNP was approximately Rp584 996 400 (7 528.5 ha at Rp60 000/hectare in government-sponsored irrigation and 14 809.6 ha at Rp9 000/hectare of community irrigation). The costs for developing new irrigated lands were approximately Rp500 000/hectare of government-sponsored irrigation, and Rp75 000/hectare of traditionally irrigated land.

By using these figures, it was also estimated that the annual protection value provided to irrigated agricultural systems by the forested areas of the greater Kelay and Segah river watershed is approximately Rp173.0 million (2 715 ha at Rp60 000/hectare in government-sponsored irrigation, and 1 234.2 ha at Rp9 000/hectare in traditional irrigation).

In areas where excessive forest clearing has led to chronic flooding, the water division of Dinas Pekerjaan Umum has undertaken river training by reinforcing riverbanks with concrete and installing groynes that use gabion baskets and mattresses, which are locally woven from galvanized wire. The cost of protecting 1 km of riverbank in this manner was approximately Rp83.7 million (ANZDEC, 1997). At the community level, it was also recommended that villagers assist bank stabilization by planting vetiver grass and bamboo.

Road maintenance is also undertaken by Dinas Pekerjaan Umum. According to the department, there are no set budgets for road maintenance; funds for road repair as a result of flooding are typically sought via special request or from external funding sources (V. Deschamps, personal communication, November 2001). On review of the most recently available documents, this appears to be the case. Although it is not clear whether funds were secured for the required repairs or not, the cost of periodic road maintenance (which includes roads damaged by floods), was estimated at approximately Rp19 million/kilometre (ANZDAC, 1997).

In addition, when natural forests are converted to agriculture, the ability of those agro-ecosystems to sustain development is often low (MacKinnon *et al.*, 1996: 535). Conversion often involves hidden costs, including:

- rapid loss of soil fertility after forest clearance, which can only be compensated for by increasing investment in fertilizers;

- loss of sustained yields of forest products;
- increased soil erosion;
- alterations to hydrological regimes of watersheds.

In all likelihood, increased forest clearing will result in greater frequencies of flooding and erosion and will have increasing negative impacts on irrigation systems, riverbanks, infrastructure and households living downstream from cleared areas. The protection value afforded by the forested areas of LLNP and the upper Segah watershed is crucial in maintaining the economic viability of these systems, as well as securing the safety of people living there.

Replenishing and maintaining groundwater reserves

Waters arising from LLNP are an important source of water for some 67 160 households in communities adjacent to and downstream from the park. Much of this water is obtained via deep wells and pumps that are fed from groundwater reserves. Perusahaan Daerah Air Mimum (PDAM), the State-owned water supply enterprise in Palu, provides water to approximately 20 percent of the households and 35 percent of manufacturing industries in the city of Palu. The remainder of households and businesses in the city draw water from wells, or from other sources. In 2001, PDAM had an installed capacity of 210 litres per second, but was only operating at 131 litres per second. Many of its wells were no longer operational owing to overexploitation of groundwater reserves in the city (V. Deschamps, personal communication, November 2001). Depletion of groundwater resulted in loss of pressure for operating artesian wells. PDAM has also closed five of its deep wells owing to a lack of water, and in 2001 drew all of its water from seven deep wells, four springs and four river intakes.

In addition to an imminent lack of water in the city, the water study conducted by Widjajanto concluded that levels of organic compounds were nearing critical levels of acceptability for clean drinking-water (Widjajanto, 2001). The study suggested that increases in these organic compounds were the result of activities linked to agriculture, plantations, communities and home-based industries adjacent to the Gumbasa River. Widjajanto identified fertilizers, pesticides and industrial solvents as possible sources of contamination.

Given these concerns, PDAM began to seek new sources of drinking-water for the Palu. One of the options being explored involved sourcing water from Lake Lindu, potentially in conjunction with hydropower development. In order to develop a facility large enough to accommodate the required capacity of 700 litres/second, PDAM is seeking foreign investment of about Rp200 billion for the intake and delivery system.

Impacts of collaborative management on biodiversity

Additional studies may be conducted to examine the impacts of collaborative management activities on keystone and other significant species of wildlife in the collaborative management area. Previous studies conducted in the Leuser ecosystem in Sumatra indicate that community-based forest management approaches based on Adat can provide socio-economic benefits while maintaining ecosystem integrity (including conservation of keystone species), provided that timber extraction is kept in check (Deschamps, 2000).

SUMMARY

The socio-economic profiles show that almost all rural residents have incomes associated with local natural resource consumption, with some households completely dependent on natural resources for their livelihoods. It is estimated that forest-based activities can contribute up to 75 percent of a total local cash economy, as well as providing high levels of basic foodstuffs and building materials, while enabling residents of forest-based communities to attain a lifestyle that is superior to that in other rural areas in the watershed (Table 10). The fact that the system is based on traditional Adat is a definite strength, making it a valid planning approach. Formal recognition of Adat is an important condition for replicating the collaborative model elsewhere.

TABLE 10
Summary of economic benefits: forest-based, agro-based and mixed systems (US\$)

	Agricultural production	Livestock consumption	Forest products	Total economic benefits
Forest-based	\$324 (22.7%)	\$41 (2.9%)	\$1,058 (74.4%)	\$1,423
Agro-based	\$260 (35.7%)	\$130 (17.8%)	\$338 (46.5%)	\$728
Mixed agro–forest	\$318 (46.8%)	\$68 (10.0%)	\$293 (43.2%)	\$679

Research has shown that the most economically productive form of land use is to retain forests for long-term harvesting of non-timber forest products and timber under a sustainable-yield regime. It also indicates that the total financial value of forest resources harvested in this manner is considerably higher than the market value of one year's harvest if all the merchantable timber were extracted in one operation, as is currently common practice (MacKinnon *et al.*, 1996). The profiles presented here support this research, and logic dictates that a collaborative management approach would ensure the sustainability of the system.

However, as an economic system, forest-based economies such as those in Berau have some vulnerable points. The remoteness and lack of access to major centres make the local market for forest products vulnerable to manipulation by traders and intermediaries. Higher-level income-generating activities can involve unsustainable levels of timber extraction and forest clearing for cash crop farming. Overuse of these activities can put stress on the ecosystem. This can affect the ability of the ecosystem to provide services to communities, with noticeable impacts on human welfare and health.

The dependency of forest-based communities on forest goods forms the crux of the collaborative management approach. Furthermore, tenure of the forests by dependent communities is key to sustaining livelihoods and alleviating poverty. Whereas much of the capital held in agro-based communities is in the form of livestock (Table 3), the vast majority of capital for forest-based communities is held in the forests that comprise their traditional land bases.

The LLNP socio-economic profile indicates that mixed agro–forest communities are more closely correlated to agro-based communities in terms of their emphasis on agricultural products and livestock inventories (Table 9). This is largely the cumulative result of imported agricultural practices from non-indigenous cultures, decreasing areas of natural forests available for mixed communities to establish natural capital and a lack of understanding of the potential benefits of sustainable exploitation of forest products. It also illustrates the need for resource-based Adat as a means of enabling and managing these opportunities. Other examples where reforestation has been undertaken to support the development of Adat-based management systems exist in Indonesia.

While this assertion may seem simplistic, the relationship between sustaining livelihoods and maintaining ecosystem integrity is very complex. Damage to the ecosystem (e.g., unsustainable logging) or restricted access to traditional land bases (e.g., lack of forest tenure rights) affect the livelihoods of forest-based communities and put them at risk of becoming impoverished. Measures that can be undertaken to avoid such situations include the recognition of traditional land bases, the acceptance of resource-based Adat as a sustainable forest management practice and the use of collaborative management initiatives between forest concessionaires and forest-based communities.

Lessons learned and the way forward

In response to the question posed in the title of this paper, it appears that collaborative forest management approaches are contributing to better forest management and poverty reduction. As demonstrated through these case studies, the promotion of forest-based systems managed through a collaborative management approach and supported by Adat can provide sustainable economic benefits to host communities. The case studies illustrate that the benefits enjoyed by forest-based communities exceed those of communities whose livelihoods are based on agricultural production. The case studies also assist in the development of guidelines and recommendation that will guide TNC, and other proponents of forest-based collaborative management, in developing similar initiatives to benefit rural communities in other areas of Indonesia.

GUIDING PRINCIPLES FOR DEVELOPING COLLABORATIVE MANAGEMENT INITIATIVES

Focus on the link between healthy ecosystems and sustainable livelihoods. TNC's Segah collaborative management project showed that healthy forest ecosystems can provide higher levels of economic benefits than agro-based or mixed forest–agro communities. To the host community, the greatest benefit of these functions is the livelihoods that they support.

Let the community guide the process, but provide sufficient information and expertise to allow it to make informed decisions. TNC's collaborative management projects in East Kalimantan and Central Sulawesi demonstrate that the use of existing management structures (i.e., Adat) supported by focused external resources and the introduction of easily understood new concepts (e.g., management bodies, community conservation agreements) develops project ownership by the community and builds a long-term commitment to conservation (Deschamps, 2004). In order to ensure that communities are empowered with decision-making abilities, it is critical that land tenure/rights of use be formalized without detriment to host communities.

Develop and execute the project with a long-term vision. Activities should be initiated in which the host community has the need, capacity and resources to continue post-intervention. Projects can easily become unsustainable as a result of high levels of external inputs with no clear strategy for supporting capital-intensive activities (e.g., infrastructure) once the primary donor agency has withdrawn. In order to avoid such a situation, a comprehensive exit strategy must be developed by the primary project facilitator.

RECOMMENDATIONS

Specific recommendations for activities that should be undertaken in Indonesia include:

- conduct mapping of traditional resource land bases for indigenous communities;
- document and secure legal recognition of resource-based Adat for indigenous communities, and formulate, document and secure legal recognition of resource-based Adat for non-indigenous communities;
- promote CCAs between logging concessionaires and forest-based communities, with the assistance of NGOs as facilitators;
- promote the reforestation of degraded forests in proximity to agro-based and mixed forest–agro communities in order to provide a potential resource base for forest products (one of the current trends in support of reforestation is the implementation of CDM-compliant reforestation initiatives under Indonesia's ratification of the Kyoto Protocol).

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