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Stream: Forestry

## **Environmental Management in Gunung Mutis:**

### **A Case Study from Nusa Tenggara, Indonesia**

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World Wide Fund for Nature Nusa Tenggara  
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## I. INTRODUCTION

The island of Timor covers an area of 28,000 square kilometers and is the largest of the many islands located in the eastern Indonesian archipelago of Nusa Tenggara. Cultural traditions are diverse and strong among the populace of Nusa Tenggara, the majority of whom find livelihood sources in agriculture and raising livestock. Infrastructure such as roads and electricity are available to only a small portion of the population and their access to health care, education, and other services are very limited.

Although scarce and fragmented, Nusa Tenggara's forests are important at the

local, regional, and international levels. At a local level, communities use forest areas as grazing lands for livestock as well as a source of income supplements, building materials, and fuelwood. Given Nusa Tenggara's arid climate, forested areas play a critical regional role as water catchment areas, especially given their location in the steep, mountainous interior. The unique ecology of forested areas and their high levels of species endemism and biodiversity lend international importance to their conservation. The government of Indonesia has declared several of these internationally important areas as National Parks and Nature Reserves.

The focus of this case study is the conservation management and community participation in the Mt. Mutis Nature Reserve (Mutis) in West Timor. Mutis is one of a number of forest and conservation areas involved in a regional review of land use and forest management by the NTCDC. The Nusa Tenggara Community Development Consortium (NTCDC) is a network of government agencies, NGO's, universities, and community groups who collaborate on common issues in community development. The Conservation Working Group of the NTCDC has been active in the field of community based natural resource management and their activities include participatory research and mapping, awareness raising, and biodiversity conservation.

The 12,000 hectares of the Mt. Mutis Nature Reserve include unique montane forest dominated by homogenous stands of *Eucalyptus urophylla*. The forested slopes of Mutis are a critical watershed for the island of Timor and play a strong role in the culture and economy of fourteen villages located in and around the reserve. In cooperation with the Conservation Working Group, World Wide Fund for Nature, Nusa Tenggara (WWF) has been active in Mutis and neighboring communities through livestock censuses, settlement studies, and participatory mapping. Several issues have problematized effective management of the reserve, especially the high-density of free-ranging cattle within the forest, lack of clarity over reserve boundaries, and confusion over reserve classification. WWF is planning a collaborative research effort with the NTCDC affiliated Natural Resources Management Research Team (Koppesda) in order to assess the importance of cattle to communities and to measure their impact on forest regeneration.

## II. GENERAL SITE SPECIFIC CONDITIONS OF MUTIS AND ADJACENT COMMUNITIES

### **Significance of Mutis and its Value for Conservation**

The value of the Mt. Mutis Nature Reserve can be seen at three levels: international, regional, and local. At the local level, Mutis' forest has long been used and managed by adjacent communities as a grazing area for livestock as well as a source of household water, building materials, and fuelwood. Both non-timber and timber forest products, such as honey and sandalwood, respectively, play a role in supplementing household income.

At the regional level, the Mutis forest complex provides a critical water-catchment

area for the island of Timor. Boasting the province's highest peak (Mt. Mutis at 2427m), the complex's steep forested slopes contain the headwaters of all of West Timor's major rivers, such as the Benain and Mina, as well as several feeding into East Timor. The hydrological value of Mutis is especially important given its high annual rainfall (2000-3000mm) and long wet season (approximately seven months) relative to drier surrounding areas (800-1000mm) experiencing a wide, unpredictable range (100-150 days) of rain per year.

At the international level, the ecology of Mutis is unique to Indonesia: the seasonal montane forest is composed of nearly homogenous stands of *ampupu* (*Eucalyptus urophylla*), constituting an ecosystem found nowhere else in the country. Furthermore, the forest lies within the transitional zone between the Australian and Asian faunal realms and boasts fauna representative of each continental mass.<sup>1</sup>

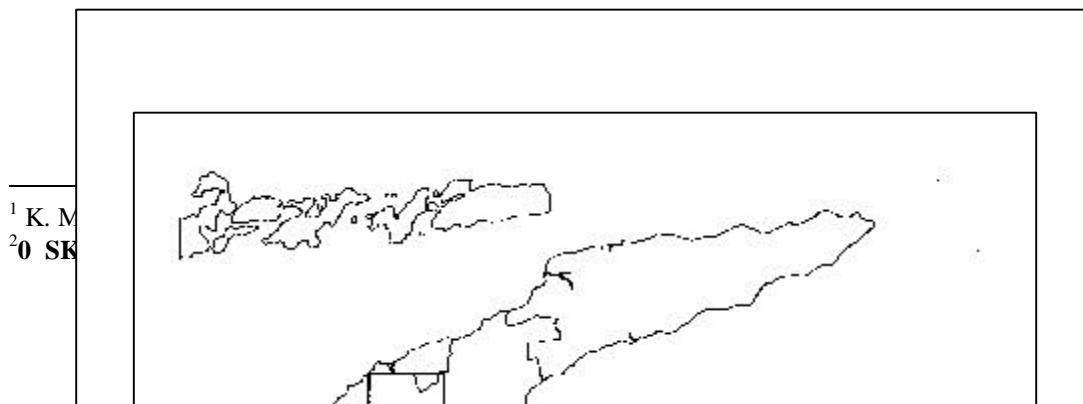
### Classification and Administration of Mutis

In Indonesia, the vast majority of forested lands are considered state owned and fall under the jurisdiction of the Ministry of Forestry, the agency broadly vested with management authority. The system of forest land classification is complex; for the purposes of this case study, it is necessary to explain two types of classification (see Table 1). To protect watersheds the government has designated Protection Forest (*Hutan Lindung*) which is under the jurisdiction of the forest service (DPKT) at the district level (*kabupaten*). For the purpose of biodiversity conservation, a number of protected area classifications exist, including that of Strict Nature Reserve (*Cagar Alam*) which is under the jurisdiction of the Department of Natural Resources Conservation (KSDA).

**Table 1:** Selected Forest Area Classification and Administration in Indonesia

<b>5</b> Land Use Category	Designated Land Use Function	Responsible Agency
Protection Forest	Watershed Protection	Forest Service
Strict Nature Reserve	Biodiversity Conservation	KSDA

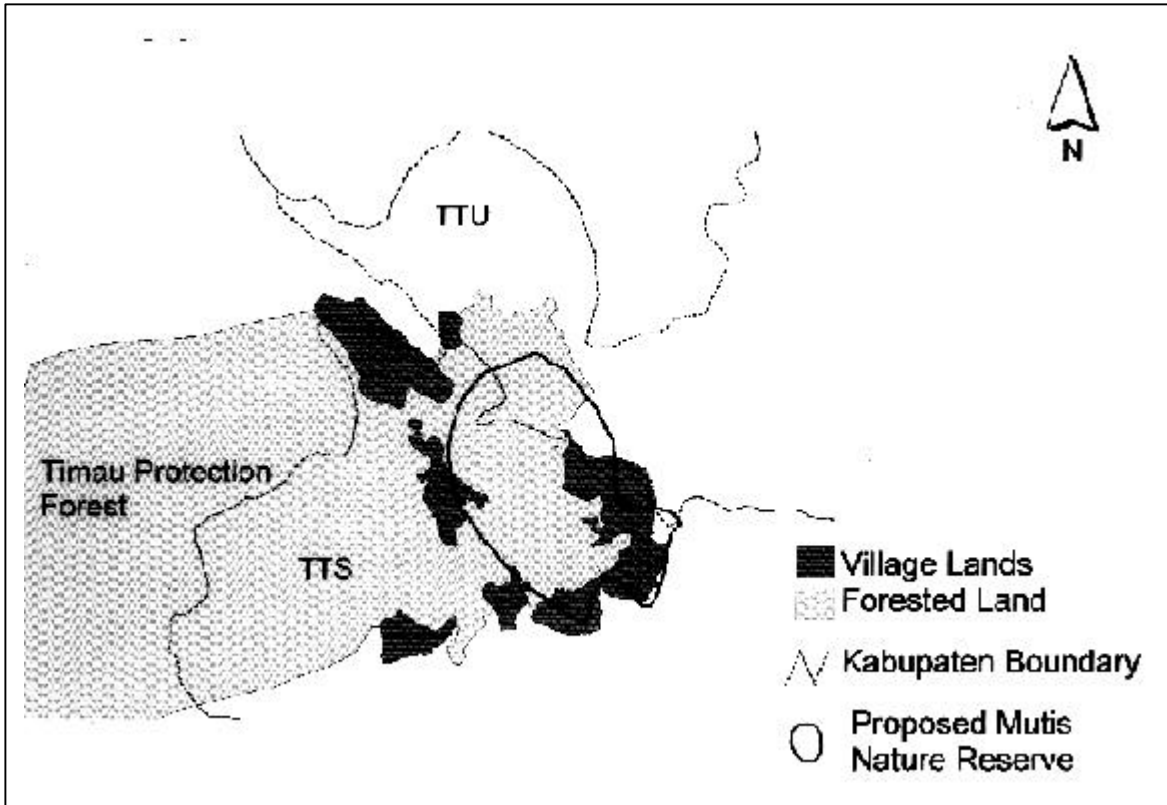
According to a national decree<sup>2</sup> issued in 1983, approximately 12,000 hectares of Protection Forest in the Mt. Mutis-Miomaffo complex was designated the Mt. Mutis Strict Nature Reserve (*Cagar Alam G. Mutis*). The western edge of the reserve is adjacent to the much larger Mutis-Timau Protection Forest (100,000 ha). The area contained within Mutis falls within the two districts of North Central Timor (TTU) and South Central Timor (TTS), in Timor which is part of the eastern Indonesian province of East Nusa Tenggara (see Figures 1 and 2).



<sup>1</sup> K. M  
<sup>2</sup> 0 SK

**Figure 2:** Map illustrating the island of Timor and location of the Mutis Reserve.

Two bureaucratic issues confuse the effective management of Mutis, namely lack of clarity of *where* the reserve boundaries lie and *which* department has jurisdictional authority. The lack of clarity over the location of reserve boundaries stems from the fact that the decree made in 1983 establishing the 12,000 hectare Mutis Nature Reserve was not followed by field checking and placement of concrete pillars indicating the boundary. Boundary markers are not visible in the field and villagers claim that the boundaries visible on the map have infringed on agricultural and village land (see Figure 3).



Fourteen villages border directly on Mutis, nine of which are located in TTS and the remaining five in TTU. According to recent census data collected by WWF, the population in these villages is 25,198 residents. The majority of the residents are indigenous to the region and hail from the Mollo and Miomafo peoples. In addition to the indigenous inhabitants, relative newcomers to these villages include immigrants from within Timor (Amanatun, Amanuban, etc.) and from outside the island (Bugis, Sabu, Rote, and Flores).

### *Societal Indicators*

The level of formal education among the population is relatively low, the majority having not graduated from primary school. The level of infrastructure varies greatly between villages, where some can be reached easily via paved roads and public

transportation; others require ten-kilometer long hikes. Electricity is available in none of the villages. With only one permanent clinic and seven smaller posts, health services are very limited in the fourteen villages.

### *Livelihood Strategies*

Livelihood strategies center around farming and livestock rearing. Agriculture in the area incorporates crops both for household consumption and market sale. Farming systems are based primarily around a system of dry-land crop rotations to ensure continued soil fertility and farmers demonstrate good skills at determining which crops are suited to what soil type. Crops grown for household consumption include assorted tubers, corn, and dry rice. Irrigated rice agriculture can be found on a small scale in several villages. In recent participatory surveys conducted by these researchers, farmers noted that several constraints, most notably strong winds during the western monsoon season, restrict their ability to grow enough food crops to satisfy their own households' needs. Income generated from cash crops such as garlic, white and green onions, herbs, coriander, lemongrass, and fruit trees (especially citrus), supply farm households with the resources to buy rice and other staples. Other crops such as potatoes, beans, and assorted vegetables are grown for both household consumption and sale in the market.

Animal husbandry incorporates large livestock such as cattle and horses as well as small livestock such as pigs, chickens, and goats. Horses were introduced by the Portuguese several centuries ago while, more recently, the Dutch introduced Bali cattle in 1912. Bali cattle have since become the dominant livestock species in and around Mutis; each family usually keeps one cow tied close to the house for fattening and eventual sale. In general, however, grazing systems are still extensive where the majority of large livestock are allowed to range freely within the forest (i.e. within the boundaries of the reserve). Villagers also report that many forest grazing cattle have since gone wild and cannot be recaptured.

Aside from the importance of the forest to local communities as an area for livestock grazing, the forest also plays a significant role as a source of income supplements, water supply, building materials, and fuel-wood. Income supplements consist of honey collected from wild bee nests and valuable timber forest products such as sandalwood. Water is piped from springs in the forest to households for use in cooking, drinking, bathing, etc. Building materials and fuel wood are collected from the dried trunks and branches of naturally fallen *ampupu* trees.

### *Local Cultural Traditions and Forest Management*

Before the Dutch colonized West Timor, the upland society in and around the Mutis forest was governed by a system of powerful kings who commanded subordinates, or small kings, ruling over smaller areas. The subordinates oversaw village society and enforced a system of customary laws (*adat*) that regulated interactions between land and people and maintained the order of social structures.<sup>3</sup> When the Dutch moved into the

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<sup>3</sup> Villagers identify four levels of social divisions: first, the *Amaf* or *adat* figure; second, the *Usif* or king/ruler; third, the *Meo* or soldier; fourth, the *Tob* or regular folk.

area in 1905, they chose not to fundamentally alter the structure of ruling kings and kingdoms, but instead, only modified the indigenous governing system slightly: for example, the small kings became known as *fetors*, a title still recognized by upland villagers.

Colonization did not influence the system of *adat* traditions that had long regulated village life. *Adat* figures (*Amaf*) still arbitrated matters pertaining to customary law and relied on the ruling class (*Usif*) to enforce their decisions; the system of *adat* laws remains much the same today. However, in spite the customary laws' longevity, a shift has occurred in the society's allegiance from strict obedience to the kings and *adat* figures to increasing observance of a rationalized state apparatus. The last *fetor* died in March of 1997 without leaving a clear successor and it appears that the local village head, a figure who represents the modern Indonesian Republic, has since increased in stature.

The *adat* traditions are especially relevant to a discussion on planning conservation for Mutis because they have long regulated how people interact with their environment. Traditionally, forest land was divided into a network of *Osufs*, or areas of usage overseen by *adat* figures representing particular settlements; streams marked the borders of a *suf*. Within a given *suf*, villagers from the respective settlement would graze their cattle and collect honey or dried wood in line with a set of strict regulations enforced by fines. If a villager collected resources from a neighboring *suf* or violated the regulations in his own (such as harvesting sandalwood, harvesting live trees, etc.), he would have had to pay a fine set by the *adat* figure (for example, purchasing a water-buffalo to be slaughtered and eaten together with the grieving party). While villagers largely credit the customary system of natural resource management with conserving the primary forest in Mutis, it is unclear whether its efficacy will continue in the face of social changes resulting from modern economic and governmental pressures.

### III. BACKGROUND AND INSTITUTIONAL CONTEXT

#### **The Region of Nusa Tenggara**

The Nusa Tenggara region of southeastern Indonesia comprises three provinces, West and East Nusa Tenggara (NTB and NTT) as well as East Timor, and includes a population of close to eight million people. By most indicators, the region is one of the poorest in Indonesia: Per capita incomes are about one third the national average<sup>4</sup> while rates for infant mortality and adult illiteracy rank as the highest in the nation (Corner, 1989). Agriculture and livestock rearing absorb the majority of the workforce.

Farmer / pastoralists operate in a diverse range of agroecosystems including the driest areas found in the country. The upland areas of Nusa Tenggara pose particular challenges for alleviating the residents' poverty: Inhabited primarily by tribal minorities farming steep, erosion-prone slopes, upland communities have limited access to both government and private sector services and are poorly represented in the political process.

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<sup>4</sup> In 1995, annual per capita income in NTT, the province including West Timor, was Rp 785, 281 (US \$ 357) while nationally, the figure was 1,940,462 (US \$ 883); the province's population displays the nation's highest incidence of poverty (*Kompas*, 1997; BPS, 1997). All calculations from Indonesian Rupiah to United States Dollar assume an exchange rate of Rp 2200 per dollar.

## The NTCDC

Recognizing the need for a broad based, coordinated approach to development in the region, the Nusa Tenggara Community Development Consortium (NTCDC)<sup>5</sup> was created in 1990 as a non-binding, collaborative network to convene stakeholders around their similar interests and experience with development issues in the uplands. Beginning through small meetings between a handful of community development organizations that had programs, activities, and field experience in the uplands of Nusa Tenggara, the network has expanded organically to include an ever-wider network of public officials, practitioners, researchers, and community leaders. Representative of four sectors (NGO, government, universities, and communities), the network currently encompasses over 100 partners operating in seven program fields and working groups: conservation of natural resources, agroforestry, land affairs, gender, marketing, extension media, and participatory methods (especially Participatory Rural Appraisal and mediation).

### The CWG and its Approach to Conservation

In 1991, the NTCDC began to develop a strategy for addressing conservation and community based natural resource management issues through the formation of the Conservation Working Group (CWG). First convened around a cross visit to conservation areas in Indonesia's easternmost province of Irian Jaya, the CWG has since held a number of consultative meetings in order to fashion a working network of key stakeholders – government agencies, local and international NGO's, community members, and research institutions. The CWG has been active in raising environmental awareness, conserving biodiversity, and promoting community based natural resource management (CBNRM). CBNRM is a family of natural resource management approaches with links to the fields of conflict management, social forestry, rural development, co-management of protected areas, as well as participatory methods of data analysis and research.

A pivotal moment for the CWG occurred during a strategic planning meeting in September of 1995. Held to provide a venue for participants to share experiences and explore common needs, the meeting was instrumental in the CWG's development of an overall strategy and in the formation of a working network. Participants at the meeting identified Mutis as one of eight sites<sup>6</sup> selected based on criteria of biodiversity, geographical representation, institutional mix, government classification, and intensity of conflicts and problems. The principle issues and potential conflicts being addressed in these sites include boundary setting, forest status, cattle grazing, fuelwood gathering, and customary (*adat*) versus state law. At the foundation of all these issues is *who* is involved and *how* in the decision making process. Thus the emphasis is directed towards

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<sup>5</sup> In 1997, Consortium members voted to change the network's name from the Nusa Tenggara *Uplands* Development Consortium (NTUDC) to the Nusa Tenggara *Community* Development Consortium (NTCDC).

<sup>6</sup> The others are Wanggameti in East Sumba, Sesaot and Rempek in Lombok, Ruteng and Riung in Flores, Tambora and Taliwang in Sumbawa; additional sites are also under consideration, provided the decision be based on the above criteria.

participatory planning, collaborative problem solving, and inclusive management approaches.

One of the working group's programs has focused on developing participatory research and convening approaches to the management of protected areas in Nusa Tenggara. Using research as means for convening stakeholders in analyzing and resolving forest management conflicts, these consensus-based approaches have grown out of a series of annual conflict management reunions where representatives of priority sites present case studies for collective analysis and collaborative planning. During reunions in October 1995 and November of 1996, representatives from Mutis presented their case and WWF emerged as the institution with the will and resources to take the lead in that site. Following the activities in West Lombok in late 1996,<sup>7</sup> and those in East Sumba in early 1997,<sup>8</sup> Mutis will become the third site to experience the application of a Consortium-stimulated, collaborative research process focused on the issue of livestock grazing within the reserve.

### **Government Actors in and around Mutis**

Several government agencies play a significant role in the management of the Mutis reserve, most notably two branches of the forest department and the livestock service. Several leaders from KSDA have been active in the Conservation Working Group of the NTCDC and have worked closely with NTCDC partners in designing conservation management strategies for priority sites including Mutis. A relatively recent player in the management of Mutis, KSDA began field level activities in accordance with the protected area's (incomplete) change in classification to a Strict Nature Reserve. Their main responsibilities include raising awareness about the benefits of conservation and enforcing relevant conservation legislation. In relation to Strict Nature Reserves, legislation explicitly prohibits human activity of any kind (except research and education), although in practice their capacity for enforcing these laws is limited.

The district forest services still operate in Mutis in line with its (former) classification as a Protection Forest. Concerned with safeguarding the hydrological value of the area, their primary activities consist of reforestation programs both within (*reboisasi*) and outside (*penghijauan*) of reserve borders. Both the forest services' and KSDA's position with regards to free-ranging livestock within the borders of Mutis is that the cattle must be removed in accordance with their respective national mandates regulating protected areas. However, they have delayed the enforcement of these laws primarily because they lack the resources to do so and also because they realize the complexities of attempting the relocation.

Similar to the district forest services, the livestock service (*Dinas Peternakan*) operates at the district level under both district level governments. The livestock services' primary task is to increase the population and productivity of breeding stock in line with developing a leading provincial economic sector. They have a very significant stake in the

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<sup>7</sup> See referenced unpublished reports.

<sup>8</sup> See forthcoming C. Lentz et al, "Natural Resources Decision-Making in Wanggameti: A Collaborative Research and Convening Process." See also forthcoming Agus Mulyana et al, *Prosiding dan Laporan Seminar dan Lokakarya Hasil-Hasil*.



management of the reserve given that adjacent communities graze the majority of their cattle and horses within Mutis. Their agency's position regarding the livestock within the borders of Mutis is that cattle cannot be separated from the forest and they have been inclined towards encouraging the perpetuity of free-ranging cattle within the reserve through biannual vaccinations.

### **Non-Government Actors in and Around Mutis**

The NGO actor with the largest stake in the management of Mutis, and quite possibly the most active stakeholder apart from the community, is the Nusa Tenggara office of World Wide Fund for Nature (WWF). Following their opening of an office in the provincial capital of Kupang in 1994, they quickly identified Mutis as a priority program site given its unique ecology, its critical watershed value, as well as its cultural and economic importance for adjacent communities. WWF has worked closely with KSDA in preparing to design a long-term management strategy for Mutis that balances the integrity of the reserve's ecology with sustainable use by adjacent communities. In preparation for such planning, WWF has been gathering data and identifying potential problems in reserve management through their activities in community mapping, settlement studies, and *adat* research.

The original goal behind the community mapping effort was to employ GIS (Geographical Information Systems) technology to map land use patterns in communities in and around Mutis as base data both for intensifying suitable crops and for assessing the capability of village land to support cattle grazing. When work began in the field, however, mappers realized that a more pressing concern for all parties involved was determining the location of the boundaries demarcating the line between village and reserve land. WWF has prioritized and implemented a participatory mapping exercise in order to clarify the boundaries between land belonging to the village and that included within the reserve; mapping activities involve extensive socialization of mapping goals, theoretical and skills trainings, and villager-led boundary walks.

Through settlement studies, WWF has attempted to gather accurate and reliable census data on both the human and livestock populations in the fourteen villages bordering Mutis. Gathering accurate information on human population dynamics is important because WWF feels that constantly increasing population densities may pose a problem in the future. High densities of free ranging livestock may also pose a potential problem within the reserve by restricting forest regeneration. WWF has also begun a series of *adat* studies, originally planned in cooperation with the University of Indonesia, intended to determine the aspects and practices of the customary law that could be useful for long-term management of Mutis.

Finally, WWF has been active in building partnerships at regional and local levels. The organization is active in the Conservation Working Group of the NTDCDC with the goals of raising environmental awareness and building collaborative relationships among partner institutions working in the field of biodiversity conservation and CBNRM. WWF is working closely with Koppesda (Natural Resources Management Research Team, an NTDCDC affiliated team of researchers with extensive experience in participatory research) to plan a study on the socio-economic importance and ecological impact of free-ranging

livestock in Mutis. At the local level, WWF has approached community development NGO's, such as Alpha Omega and Yayasan Haumeni, interested in building farmer capacity in marketing agricultural and handicraft products.

#### IV. PROBLEMS ENCOUNTERED IN THE MANAGEMENT OF MUTIS

##### **Forest Regeneration and Livestock**

Based on field observations, WWF has identified what could be a potentially major problem in the sustainability of Mutis' homogenous *Eucalyptus* forest – low rates of regeneration. The forest is full of large mature trees, yet seedlings, small, and medium sized trees are relatively scarce.

WWF has hypothesized that the high density of cattle and horses grazing in the forest (estimated at two animals per hectare) may have a negative impact on the rate of forest regeneration. Although WWF and villagers report that direct grazing on new *ampupu* shoots is not a problem (*Eucalyptus urophylla* is unpalatable to livestock),<sup>9</sup> cattle and horses may graze heavily on more palatable species, thereby influencing the homogeneity of the forest. Furthermore, the high density of livestock could change the physical characteristics of soil structure related to soil compaction which impedes seed germination and increases erosion.

Villagers claim that the presence of livestock in the forest reduces the possibility of large scale wildfires in the dry season. By eating grass that grows below the trees, the grazing livestock reduce the fuel load, thus preventing destructive forest fires. They are acutely aware that during the dry season a fire burning too intensely threatens to destroy the forest. Whilst large scale hot fires are destructive, it may not be necessary or even desirable to preclude all fires from the Mutis ecosystem. Based on evidence from Australia, *Eucalyptus* forests largely rely on seasonal burning to stimulate seed germination and this could be the case in Mutis.<sup>10</sup>

##### **Status of Reserve Boundaries**

The approved forest utilization map (Peta TGHK) of 1984 depicts Mutis as a 12,000-hectare Strict Nature Reserve which is adjacent to the much larger Timau Protection Forest. However, the location of the Strict Nature Reserve is unclear in the field because in surveying the area, government mappers have not yet compared their maps' coordinates with conditions on the ground. Such field checking of the new

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<sup>9</sup> B. Martin and C. Cossalter, "The Eucalypts of the Sunda Islands," *Bois et Forêts des Tropiques*. 168 (1976): 3-17.

<sup>10</sup> For a recent, favorable assessment of *E. urophylla*'s silvopastoral suitability, see D. Sun et al, "Growth of *Eucalyptus pellita* and *E. urophylla* and Effects on Pasture Production on the Coastal Lowlands of Tropical Northern Australia," *Australian Forestry* 59 (1996): 136-41. For a site specific assessment of the effect of livestock and natural regeneration of *E. Urophylla*, see H. Alrasjid and A. Widiarti, "Natural Regeneration of Ampupu (*Eucalyptus urophylla*) in Gunung Mutis Forest Complex, Nusa Tenggara Timur," *Buletin Penelitian Hutan* 489 (1987): 28-41.

boundaries would include the placement of pillars distinguishing Mutis from the neighboring Protection Forest and the surrounding village land.

Some pillars that are visible in the field date from an earlier boundary placement process implemented in 1978. During that time, the mapping division of the forest department (Biphut) placed concrete boundary markers to distinguish between land included in village settlements and land classified as the Timau Protection Forest. In the process of setting the boundaries in 1978, Biphut recognized several enclaves of settlements and agricultural land encircled by the Protection Forest boundaries.<sup>11</sup> According to villagers, the enclave boundary markers followed the same boundaries established by the Dutch in the early 1900's; the villagers respect these boundaries and claim not to have violated them by opening new land within the forest.

In implementing participatory mapping activities around Mutis, WWF staff have discovered two sorts of problems associated with the proposed area for the Strict Nature Reserve. First, the new boundaries include a large amount of ancestral village land, including settlements and agricultural fields. In conversations with these researchers, villagers around Mutis expressed strong concerns about the possibility of losing their ancestral lands. Their fears are founded on translocations in the late 1970's when the government moved several settlements out of the Timau Protection Forest boundaries. Second, because such large amounts of agricultural and settled land are included within Mutis' boundaries, WWF staff has reported that the forested land in the Nature Reserve falls far short of the figure of 12,000 hectares and that the area designated as the Strict Nature Reserve is not appropriate (i.e. the protected area is protecting fields of rice and onions).

### **Land Use and Jurisdictional Control**

Three of the primary government stakeholders – the forest and livestock services and KSDA – have their own set of interests and policies regarding the management of Mutis. In many cases, these interests and policies conflict. The district forest services and KSDA disagree on the level of human activity to be allowed in Mutis. Because central government policy dictates that no human activity of any kind (except research) is allowed within a Strict Nature Reserve, KSDA believes that the reforestation activities of the forest services are in violation.

The conflict between government positions is especially apparent with regards to free-ranging livestock within the forest. The livestock services firmly believe that the livestock cannot be removed from the forest, fearing that such actions would reduce the number of cattle in their district. Regardless of whether the cattle are found to impact the forest's ecology positively or negatively, KSDA and the forest services are required to enforce laws restricting access and human activities (including the grazing of livestock) in Strict Nature Reserves.

Indeed, should the cattle eventually be removed from the forest, the event could add to the real and potential conflict over land use in Mutis occurring between government agencies and communities. In addition to the concerns raised by free-ranging livestock, a long-standing concern of KSDA is that existing communities will continue to

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<sup>11</sup> Areas recognized included three enclaves (Naijota, Nenas, and Israel) and portions of several village settlements (Fatumnasi, Tune, Tutem, and Bonleu).

expand and place pressure on the forest, through the opening of new land for agriculture. This is frequently the primary reason why communities are evicted from lands bordering on forests and resettled to other areas (translocation).

The three problems outlined above – forest regeneration and livestock, status of reserve boundaries, land use and administrative control – pose challenges for the effective management of Mutis; their commonality with issues encountered in other priority sites provides an opportunity for review of current management policies and practices in the wider context of Nusa Tenggara. Of pivotal importance to these issues are the themes of community participation and access to reliable information.

The Conservation Working Group of the NTCDC has promoted methods of participatory research and problem solving as a means of addressing complex multi-stakeholder problems encountered in the regions' forest management. Upcoming participatory research in Mutis will follow the model refined in other CWG priority conservation sites. The research will have two important goals:

- to engage relevant stakeholders through a process of learning about the problems faced in protected area management and collectively brainstorming joint-gains solutions;
- to provide sound input and data on management and its ecological impact for collaborative management planning.

Similar to other sites in Nusa Tenggara, it is clear that any research and resolution process undertaken in Mutis will need to address the conflicting positions of government actors and how they balance with both the needs and aspirations of communities and those of biodiversity conservation interests.

## V. PROGRESS, PROPOSED STEPS, AND CHALLENGES

### **Continued Mapping and Settlement Studies**

WWF has been active in the communities surrounding Mutis through gathering reliable and accurate census data and through employing GIS technology with participatory methodology to map boundaries and land use. So far, WWF has gathered complete census and settlement data on the nine villages in TTS. They plan on continuing their work in the six remaining villages in TTU.

With regards to settlement studies, WWF has devoted a large amount of time to conducting extensive surveys on livestock ownership to accurately determine horse and cattle populations. Gathering accurate information on cattle and horse populations is enormously important given their potential impact on forest regeneration. Yet, such surveys have been challenging in that villagers fear the information will be used for assessing tax payments and may lead to their animals' removal. Indeed, current official figures (BPS) reflect the fact that the farmer-pastoralists often withhold information on the true size of their herd. Preliminary WWF survey results are listed in Table 2. They have

estimated number of large livestock in TTU at approximately 6,000 horses and cattle and plan on continuing their surveys in that district.

**Table 2:** Estimated Livestock Totals for Villages in and Around Mutis

District	Total #	CATTLE			HORSES		Total #
<b>rb5</b>		Tied	Free	Wild	Tied	Free	
<b>rtTTS</b>	9	2854	11523	?	1308	2592	±18277
<b>rtTTU</b>	6	?	?	?	?	?	±6000
Totals:	14	2854+	11523+	?	1308+	2592+	±24277

Source: WWF NT Census data, 1997.

WWF’s priority of mapping Mutis’ boundaries has required extensive and repeated socialization of goals and objectives, namely that WWF is interested in documenting real conditions for discussion with relevant stakeholders. WWF hopes that the boundary maps will provide a sound point of comparison between community views and forestry maps that can stimulate productive dialogue between stakeholders over village / reserve boundaries. A second objective in mapping the boundaries is to determine whether the area of Mutis as delineated in forest department maps is the most appropriate area for a Nature Reserve; preliminary results indicate that primary forest cover is less disturbed in some areas of the neighboring Timau Protection Forest. WWF has completed boundary mapping for six of the nine villages in TTS and plan to continue their work for the remaining three villages there as well as the five remaining in TTU.

The reasons for WWF’s involvement in land use studies are two-fold. First, they hope to address the concerns expressed by KSDA over the potential impact of a growing population’s need to increase agricultural output: WWF hopes to look at available land for agriculture within the currently settled lands, to see how this is being used, and to assess the potential for maximizing productivity. The second objective of the land-use mapping is to determine whether village land can support intensification of livestock grazing should the free-ranging cattle and horses need to be removed from the forest. WWF’s participatory mapping of land-use patterns has turned out to be a time-consuming process because of the rugged terrain and extensive village area encountered in each village. Furthermore, their efforts to employ participatory methods have encouraged broad community input, a feature which has necessitated time consuming meetings to clarify goals and achieve consensus on results. WWF has preliminary land use results for two villages in TTS and plans to continue mapping in the remaining villages.

### **Livestock Research**

In line with follow-up activities planned during CWG sponsored conflict management reunions, several institutions working within the NTCDC are planning a participatory research effort on livestock grazing in Mutis. WWF is working closely with Koppesda to design and implement a pair of studies to assess the socio-economic benefits of livestock for relevant communities and also to measure the ecological impact of

livestock grazing on forest regeneration. In both studies, WWF and Koppesda will be cooperating closely with key government stakeholders such as KSDA as well as both the forest and livestock services from respective districts.

A pair of hypotheses will be tested in the research. The first hypothesis is that cattle are an important social, cultural, and economic resource to communities adjacent to Mutis. Researchers will focus on five aspects to test this hypothesis:

- history of livestock management and diversification of production;
- fluctuation of livestock populations and their contribution to regional income;
- contribution of livestock to household income as compared to other livelihood strategies, including analysis of time spent in each activity;
- management practices of free-ranging and tied livestock;
- participatory analysis of livestock's impact on the forest.

Koppesda and WWF plan to begin this segment of the research in early 1998 and envisage a three-month long time frame.

The second hypothesis is that the high density of free-ranging livestock negatively impacts on forest regeneration. To test this hypothesis will require experimental research focused on ecological features of the *Eucalyptus urophylla* dominated forest such as biomass production, carrying capacity for large livestock, and the impact of fire and grazing on regeneration. Researchers will use sample plots to test variables in forest regeneration over the long term. Whilst this experimental research will begin concurrently with the socio-economic surveys, it will take much longer to obtain results. Once the experimental research component is completed, researchers envision an integrated, inclusive workshop in which they can present the findings from both research components, identify problems, and facilitate consensus among stakeholders on how to address those problems and move forward.<sup>12</sup>

A key challenge facing researchers will be to maintain broad community participation and inter-agency interest throughout the research process. In recent surveys conducted by these researchers, community members expressed disappointment with some past research efforts because they did not receive copies of relevant reports and were not involved in follow-up measures. Furthermore, the long time frame of the upcoming research effort will require continued updates and socialization among all stakeholders to maintain interest.

### **Challenges Encountered in the Application of CBNRM: Who Represents Nature?**

The Conservation Working Group of the NTCDC has been a strong proponent and practitioner of CBNRM approaches to managing priority conservation sites in Nusa Tenggara. Through engaging a wide spectrum of stakeholders including representatives from government, higher education, NGO's, and communities, the CWG hopes to find

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<sup>12</sup> Balai Konservasi SDA VII, "Pengkajian Sosial, Ekonomi, dan Budaya Ternak Lepas" (Kupang: WWF, Koppesda, KPMDNT, 1998), 5-7.

consensus-based solutions to complex multi-party environmental conflicts.

In the priority site of the Mt. Mutis Nature Reserve, three main issues – free ranging livestock, boundary status, land use and administrative control -- illustrates several challenges facing practitioners of the CBNRM approach. It is possible that the presence of livestock benefits the forest's ecology, but it is equally possible, if not more likely that the livestock poses a serious threat. Yet, regardless of the impact cattle have on the forest, national law governing land use within the boundaries of conservation areas strictly prohibits livestock grazing. Thus, a significant problem impeding appropriate management is not just caused by competing interests between agencies, but also by centrally directed laws and policies that may not be suitable for conditions in the provinces. How can local practitioners cope with nationally dictated policy that does not fit with context-specific conditions?

Another challenge encountered with these issues that not all stakeholders view them as a “problems.” For example, WWF suspects that the livestock pose a grave threat to the forest's integrity while the villagers view the presence of free-ranging livestock as their daily norm. If the research provides convincing evidence that cattle do severely affect forest regeneration, it may be extremely difficult to convince the villagers that their way of life is a “problem” and, moreover, a worst case scenario is that their cattle must be removed from the forest. In other words, how each stakeholder sees the issue depends on where he or she sits.

Finally, another challenge facing WWF in particular is how to reconcile their institutional mission with the practice of conflict management in CBNRM. WWF is an organization mandated to conserve biodiversity and they are willing to work with community-based approaches as long as this does not compromise the ecological integrity of a given area. According to the theory of conflict management applicable in CBNRM, every party in a dispute should be represented in order to find an agreement acceptable to all stakeholders. It is a good model if all stakeholders can speak for themselves, but in the case of environmental disputes, who speaks for the trees? Who represents nature? WWF feels that they can represent the environment but they are concerned that consensus-based approaches, like CBNRM, might not necessarily be best for their constituents.

#### APPENDIX I: Glossary of Terms and Abbreviations

<i>Adat</i>	custom, tradition; customary law
Biphut	Bidang Perpetaan Hutan (Forest Mapping Bureau)
BPS	Biro Pusat Statistik (Central Bureau of Statistics)
CBNRM	Community-Based Natural Resources Management
CWG	Conservation Working Group of the NTCDC
DPKT	Dinas Perhutanan dan Konservasi Tanah (Reforestation and Soil Rehabilitation Service)
<i>fetor</i>	a small king; instituted by the Dutch
GIS	Geographic Information Systems

<i>kabupaten</i>	lit. reGENCY; district
<i>kecamatan</i>	sub-district
Koppesda	Koordinasi Pengkajian Pengelolaan Sumber Daya Alam (Natural Resource Management Research Team)
KSDA	Sub-Seksi Konservasi Sumber Daya Alam (Natural Resources Conservation Sub-Section)
Mutis	Cagar Alam Gunung Mutis (Mt. Mutis Nature Reserve)
NGO	Non-Governmental Organization
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
NTCDC	Nusa Tenggara Community Development Consortium
PRA	Participatory Rural Appraisal
<i>suf</i>	area of forest land whose resource exploitation is overseen by an <i>adat</i> figure
TGHK	Tata Guna Hutan Kesepakatan (Agreed Forest Utilization)
TTS	Timor Tengah Selatan (South Central Timor); district in W. Timor
TTU	Timor Tengah Utara (North Central Timor); district in W. Timor
WWF	World Wide Fund for Nature

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