considerable deliberation, the PAMB opted not to take action, sending the claim back to the PSTFAD without an endorsement. As this nine-month process unfolded, several mayors of municipalities bordering the park began to promote a process that would lead to ancestral domain claims that are based upon municipal boundaries, as opposed the one unified claim. The PAMB, apparently moving outside its mandate, organized a consultative process aimed at determining the best way for the Talaandig to proceed with their ancestral claim. Some Talaandig leaders asserted that PAMB and local DENR used consultation formats that have favored efforts to promote municipal-based claims. As organizing on both sides of this issue continues, no aspect of SANREM community-based research and the IPAS community organizing work is unaffected. There is a need for clear guidelines on how consultations with local communities should be conducted. It is possible that such guidelines could draw from similar work that is being done on how best to determine when "informed consent" of local communities has been genuinely gained.

Native belief that nature is controlled by a hierarchy of spirits whose wrath must be avoided, guides the tribes in a respectful attitude to the environment (Cairns, 1996). Indigenous practices such as safe havens for wildlife, preservation of keystone tree species, and restricting swidden size indicate a conservation approach to resource management. The tribes reacted to the degradation of their ancestral lands in 1993 by organizing and creating a network of 'tribal guardians' to maintain vigilance on the forest margins. Some seizures of poached lumber have been made and the initiative appears to be gaining momentum. The community-based park protection (CBPP) that is evolving spontaneously in these forest margin villages is internally-driven and has been enabled by reviving and strengthening existing tribal institutions. This determined and highly organized surveillance of the forest warrants recognition by DENR, and argues for further empowerment of these communities by formally decentralizing forest protection to their control.

The tribes' demonstrated commitment to conservation suggests that granting them ancestral domain would not be antagonistic to National Park objectives. Rather, it could form the basis of a contractual agreement in which the tribes would guarantee protection of the forest margins in exchange for commensurate development programs. The cultural diversity of the tribes has contributed to maintenance of the park's biodiversity, suggesting that cultural conservation should be an integral goal in National Park protection. Our findings indicate that while both Talaandig and migrant settlers are guilty of park and watershed encroachment, Talaandig communities represent the best bet for implementing sustainable land use systems that protect the integrity of the park. Research among a number of Talaandig communities has revealed indigenous traditions and experience in implementing land use systems that aim at maintaining a balance between natural resource extraction and forest conservation. Consensus has emerged that the policy question that now needs the greatest attention is: "How does the Talaandig ancestral domain claim and the management of lands under the claim relate to the conservation objectives of the Kitanglad National Park?"

As the SANREM Biodiversity Consortium pursues its work to develop methods for buffer zone management, it was judged opportune to hold a national meeting through which the Consortium could help synthesize the current status of such work elsewhere in the country, and share its experiences with others facing common concerns. The workshop, held in 1995, reviewed the principles and experiences in buffer zone management and agroforestry, identified lessons that could be applied in current and future buffer zone management programs, fostered closer linkages, and planned follow-up action that will accelerate the successful implementation of buffer zone programs in the Philippines (Garrity, 1996).

The development of a natural resource management plan for Lantapan was not conceived as an initial objective of SANREM. The concept emerged as a result of two streams of converging issues: the imperative for the overall SANREM project to focus its many activities toward a clear, tangible goal; and a vision that emerged during discussions with the mayor, Mr. Teddy Pajaro, that the municipality would benefit materially from having a plan that could incorporate all the scientific outputs that had been assembled. The decision to launch a municipal natural resource management planning process was made in 1996. A multi-sectoral Natural Resource Management Council was formed, with participation from individuals representing the various economic, social, and religious segments of the community. The draft plan was circulated and subjected to public hearings, and finally enacted by the Municipal Council in early 1998. The plan, and its process of development, are discussed in detail in another presentation at this conference.

Enhancing Agrodiversity: Agroforestry Systems for Sustainability, Livelihood, and Building a Social Contract

Agriculture is the dominant livelihood of people living in the villages near Kitanglad Park and most other protected areas in the tropics. Intensification of the agricultural systems in the vicinity of the park is crucial to reducing encroachment pressure in the park. Agroforestry land use practices are favorably suited to the boundary zones of protected areas. Complex agroforestry systems, particularly mixed perennial systems, are an attractive model for buffer zone management (Michon, 1993; Michon and de Foresta, 1990). Such systems may provide more stable and sustainable returns than monoculture systems of food crops or perennial crops, particularly under low input management (Garrity, 1994). They may also greatly enhance the level of biodiversity protection in agroecosystems, and may extend natural plant and animal biodiversity outward from the protected ecosystem into the agricultural landscape, as is evident in the case of the resin, rubber and fruit agroforests in Indonesia (de Foresta and Michon, 1994). Agroforestry practices provide a variety of ways in which agriculture can be intensified, tree cover can be enhanced, and biological diversity can be extended on the outside of protected areas. There is growing interest in the development of more intensive land use systems for forest margins all over the world. ICRAF is coordinating a global research program on Alternatives to Slash and Burn that seeks to identify policy and technology directions to guide national efforts (van Noordwijk et al., 1995).

The boundary area of Kitanglad Park is located at an elevation (600-1700 m), where temperate vegetable crops (including potatoes, cabbages, and tomatoes) are quite productive. Vegetable production is expected to further expand dramatically in the future. Our analysis indicates that the most likely future trajectory for farming systems in the buffer zone will be toward continuous vegetable production on a portion of the farm (0.1-1.0 ha), with perennials (timber or fruit trees) grown on the remaining farm area, particularly on the steeper parts. A farming systems survey including 67 families in three villages provided a picture of the current farming systems in the buffer zone (COPARD, 1996). During the training exercises that were held in each village, farmers drew a diagram of their current farm layout and enterprises. Later they constructed a new diagram of their vision of their farm in the form of a plan for gradual implementation: the most common plans were for the establishment of contour hedgerows on the annual crop areas of the farm, and increasing the area of fruit and timber tree crops. We developed a farmer-participatory research effort to backstop this self-perceived vision. The consortium focused on three technology-related initiatives:

Enabling environment for smallholder tree production;
Participatory contour hedgerows initiative; and
Intensifying indigenous fallow management.

These research activities were implemented to develop sustainable agricultural systems in the upper watershed. They were seen as key components of the evolving social contract. The following sections describe the activities specific to each of these initiatives.

Building the Enabling Environment to Enhance Smallholder Tree Production Systems

We hypothesize that public sector support to build the enabling environment for smallholder tree production is a superior way to advance national, international, and private objectives for watershed protection compared with support for contract reforestation or large-scale plantations. Enhancing tree production would also increase rural income and reduce risk, and improve equity and participation in development. Contract reforestation, however, continues to be a dominant paradigm for public sector involvement in forestry. It has failed to deliver on expectations (Byron, 1998). An underlying assumption is that farmers don't want to grow trees, and if you want to encourage tree production among smallholders you'll have to pay them to do so.

Prior attempts to reforest the buffer zones of protected forests in the Philippines have tended to focus on the public sector (DENR) and the planting of large blocks of trees with local wage labor. These tree plantations were then guarded against fire and encroachment. Such a project was implemented in the Manupali watershed not long before SANREM began. Like so many other such top-down attempts, it was a failure. The plantations were burned out, often by local smallholders across whose land the trees were planted. Only remnant stands remain in the reforested area. Meanwhile, there is mounting evidence that smallholders will enthusiastically plant trees on their own farms if they have some semblance of tenurial security. There is increasing acceptance of the idea that smallholders are the key to future reforestation efforts in the tropics (Pasicolan, 1995; Garrity, 1994). Research in northern Mindanao (including Lantapan) has documented an enormous transformation toward smallholder timber tree production in this region in response to market development (Garrity and Mercado, 1994). The evidence from many countries now shows conclusively that smallholders have a strong affinity to grow trees for market if there is a demand for them (Arnold, 1997).

The approach we are testing is to ensure that the demand for trees and tree products is strong, market infrastructure is adequate to keep marketing costs low, price information is available, improved germplasm is widely available of a variety of species to enhance yield and reduce risk, and that best management practices suited to local farm circumstances are in place. If these conditions are in place, smallhold farmers will grow trees on a substantive scale. They will not need to be paid to do so; in fact, paying them to plant trees will be counterproductive. If these conditions are not in place, these enabling conditions should be the focus of public sector efforts, not tree-planting subsidies. The research program is testing the 'enabling environment' hypothesis as the basis of our work in smallhold timber production systems. What are the most conducive and cost-efficient ways to enable wide-scale planting of trees by farmers? For cost-efficiency we look toward:

1) *Better germplasm diffusion* or cheap, effective methods of setting up large numbers of community and household nurseries;
2) *Species diversification* or ways of diversifying the species that farmers plant by:
    - expanding the market for species that are not currently grown,
    - evaluating alternative species for a range of soil and elevation conditions, and
    - developing new indigenous species; and
3) *Improved tree management* or refining the management practices for the major species.

Many studies have indicated that forest-based communities need to be empowered in the planning and implementation of natural resource management projects (Wynter, 1993; Fisher, 1994; Gakou and Force, 1996; Prein and Lopez, 1995) that employ tree-planting as an approach to forest replenishment (Postel and Heise, 1998; Rao, 1985; Cernea, 1989; Koffa and Garrity, 1996). They argue that smallholders will plant trees on their land if they have some form of rights to the trees and land, and have a suitable supply of adapted tree germplasm with a ready market (Garrity, 1994; Garrity and Mercado, 1994). Our initial work focused on determining an appropriate mix of species of interest to farmers, and testing diffusion strategies to incorporate them into farming systems rapidly and cost-effectively. The model that emerged for reforestation of the buffer zone was reliance on the self-interest of smallholders to plant trees on their own farms.

A farming systems survey (COPARD, 1996) and our previous training exercises (Koffa and Garrity, 1996) indicated that farmers in the buffer zone and private lands are very interested in expanding the area of timber trees grown on their farms. The constraints to accelerating the process are inavailability of low cost and convenient seedling supply, knowledge of appropriate tree management, and availability of a wider range of tree germplasm to diversify risk.

Farmers currently have a very limited repertoire of potential timber species to choose from, due to inadequate knowledge of recent developments in tree germplasm development, and lack of planting materials of new tree options. We developed a comprehensive database on multipurpose tree species performance by elevational belt in the upper watershed based on participatory rural appraisal methods (Glynn, 1996).

The first step was to understand the performance of the species and provenances currently grown by households along the elevation gradient. We designed a survey that captured the observations of smallholders, and tested a method that hybridized participatory and more conventional mensuration approaches (ICRAF, 1997). An identification of the major perennial species followed a vigorous literature search to summarize existing information on their performance by elevation based on other data sources . We then conducted an informal survey (Glynn, 1997) across the watershed in January 1996 to make a more accurate separation of watershed classes, estimate sample sizes needed and sampling design, select the best candidate species for a more formal survey, define the parameters to be measured, and develop the interview protocol . On the basis of the informal survey the watershed was broken down into six elevation strata (later aggregated into four zones). From the original list of 38 species for which observations were recorded, those for which frequencies were impractically low were discarded. The resulting performance patterns of the remaining species were then compared to the elevational ranges as given in the existing literature. Those species exhibiting strong correlations with their reported range and whose ranges were not suitable to the midland/highland climate, were also dropped from further analysis. The literature review had highlighted some species whose climatic suitability greatly depended on variety. These case distinctions were made on the basis of variety. Additional species were added to the remaining list at the recommendation of the local enumerators. This yielded a priority list of nine timbers and 17 fruit species for the formal survey.

In the formal survey informants were asked to rate (on the basis of other specimens of the species they had observed elsewhere) the rate of girth thickening, rate of vertical growth, and timber quality of the bole of the trees of their own farms. The enumerators measured the girth and height of each tree and noted the slope and elevation where it was planted. The survey revealed that there was very little variation in fertilizer application practices among farmers (93% did not fertilize), or in planting materials (100% used seedlings). A tree spacing of 2-3 m predominated (86%). The spacing variability showed no association with elevation. Seventy three percent of the sample population was on land of 0-3% slope. There were no significant differences in the slope of the locations sampled between zones. There was substantial variability in source of the germplasm, used by farmers, with the majority obtained casually and locally (73%). Line planting was the dominant planting pattern (81%). Pruning and weeding practices were the strongest potential sources of performance variability. Pruning was done on 63% of the observations. Weeding was done on 43%. Frequency of pruning was higher in the lower strata.

Gmelina arborea Roxb. is the most commonly grown timber tree in Lantapan. The literature-recommended range for commercial production is less than 1000 masl. Our results showed a strong negative trend between elevation and girth thickening, height growth, and bole quality. Further testing detected a significant decline in perceived performance between the lower mid-altitude (701-1200 masl) and upper mid-altitutde (1201-1400 masl) zones. Regressions for the measured relationship between *Gmelina* diameter at breast height (dbh) and age were different for the lowland and highland. The regression line showed an advantage of 5 cm after two years. The slopes of the regressions were not significantly different, indicating that this difference did not increase substantially with age. This implies that the major difference in growth performance by elevation occurs in the first two years. A regression of measured dbh values by age classified by farmer ratings of either 'good' or 'poor', may be conceived as farmers' perceived growth rates for these categories. The regression indicates that the average rate of girth thickening for trees rated as 'poor' was about 0.4 cm/year, while for those rated as 'good' it was about 2.5 cm/year.

Are farmers' opinions reliable indicators of species performance patterns? Farmer response by elevation patterns were similar to expected trends as gleaned from the literature and at least two of these responses - 'good' and 'poor' -- appeared to reflect genuine differences in growth rates when quantitative data were plotted in response class series (Glynn, 1997; ICRAF, 1997). Where the participatory method fell short was in conclusively identifying underlying causes for performance differences ('why do they grow poorly?'). Enumerators reported respondents as accommodating and interested. Enumerators appreciated the flexibility of the sampling design (by species quota rather than number of respondents). This enabled them to customize interview time to suit the interest level of the respondent.

It appears that the best results for reconnaissance level research on species performance by elevation could be obtained by hybridizing the two approaches (farmer perception survey and tree growth measurements). Use of perceived performance as an indicator of actual performance may be a more efficient approach at a broad scale. Note that nine species were considered here for perceived performance patterns compared to one for measured observations. Calibration of the response classes to get a general estimation of growth rate will further strengthen the results (but slow the sampling rate). Careful sampling design and collection of at least the most rudimentary information regarding confounding performance variables would flag potential dangers of misconclusion. A perception survey could be a valuable tool in reconnaissance-level research, yielding scientifically credible results with the capacity to support technical research planning.

Site-compatibility trials based on these results have now been established for eight timber species on 14 farms across a range of altitude, slope, and aspect. This work is being complemented by investigations to domesticate a number of local species identified and used by farmers for timber.

The most common timber species planted in the upper watershed are *Pereserianthes falcateria, Gmelina arborea,* and *Eucalytus camaldensis*. Farmer experience indicates that *Eucalyptus* performs particularly well at the buffer zone elevation levels (Glynn, 1996). We introduced germplasm of a range of other fast-growing timber species, with emphasis on new accessions of *Eucalyptus deglupta* and others. Farmers expressed interest in the propagation of adapted local forest species on their farms. Constraints to their propagation were, therefore, investigated (Palis, 1997). This was followed by the development of a series of trials to evaluate available commercial species for performance by elevation. Experimentation with a model of smallhold private nurseries strengthened experience with tree propagation. Documentation of these ventures is developing insights on the appropriate model to tap the entrepreneurial and technical spirit of individuals or groups to allow a continuous and growing supply of tree materials for outplanting on farms in the buffer zone.

A series of consultative workshops were conducted in three buffer zone villages (Cawayan, Kaatuan and Songco). They identified timber tree species that farmers preferred, the uses that they had for these species, their production and management constraints, and the pertinent training needs. Forty species (exotic and indigenous) were identified and their uses, and production and management knowledge gaps, were determined. A nursery was established (in Songco) to mass propagate experimental seedlings of preferred and other tree species, and serve as an experimental and extension arena for training on propagating new or lesser known species. Eight village-based nurseries and 15 small-scale woodlots were established by neighborhood (hugpong) members. Farmers propagated 10,000 seedlings of the nine species. Species-site compatibility is crucial to tree domestication, and the lack of knowledge on this aspect of forest regeneration is a factor why many reforestation projects failed. Species by elevation trials were established on 14 sites ranging in elevation from 350 to 1700 m. These trials are determining their growth response to elevation, and thus superior trees for different elevations. Thirty eight farmers have received hands-on training on pre-nursery (planning, etc.), nursery (seedling production and maintenance, etc) and post-nursery (plantation establishment and maintenance) management practices. They formed the core of new nurserymen in their villages, and are now trainors for much larger numbers of new nurserymen in other villages.

We are comparing the pros and cons of three types of nursery systems and how they may be mutually reinforcing: private small-scale nurseries, neighborhood or hugpong nurseries, and village-level nurseries. By implementing nurseries with enthusiastic partners at all three scales we will develop case study experiences and general guidelines to inform the private and public sectors about more effective nursery development. The basic research question is: "Which approach is most effective in making tree-growing a smallholder culture?".

Boundary Plantings to Delineate the National Park

Wells and Brandon (1992) noted that marking the boundary of a protected area with a band of trees was practiced in several projects. It proved effective in alleviating encroachment, when combined with other aspects. This experience suggests that such a practice ought to be considered as a component of any agroforestry initiative outside park boundaries in ICDPs. The Integrated Protected Areas System for Kitanglad National Park intends to delineate the national park boundary by planting recognizable species along the boundary. The Consortium is working with the National Park Director and the Kitanglad Integrated NGOs to link the boundary planting program with the smallholder nursery system in Lantapan. This will test and implement a mechanism by which smallholders are contracted to supply the seedlings, outplant them, and care for them during the initial years of growth. We intend to develop this as a model for such programs in other protected areas.

Developing Indigenous Species Alternatives

The declaration of the park as a protected area has virtually stopped illegal logging. Continued extraction of timber on a small scale by villagers has led to gradual decimation in number and diversity of species (Palis, 1996). Tree cultivation in the watershed relies on only a few fast-growing exotics. There is an urgent need to maintain a broader diversity of tree species to reduce production risks. This necessitates the development and use of lesser-known local species. Prospective species need to be identified, their properties and market potential assessed, and simple propagation methods developed to make them commercially viable alternatives. Initial surveys were done during the first phase through a series of meetings with the upland dwellers, coupled with ground fieldwork (Palis, 1997). They revealed that more than 50 local tree species are found in the mid-level of Mt. Kitanglad; of which 18 species were preferred by the local farmers for a number of economic uses such as material for house construction, furniture and fuel, among others (Table 1). A team composed of four

Table 1. Indigenous Tree Species Identified and Selected by Farmers (from Palis, 1997).

Common/ Vernacular Name	Scientific Name	Family	Use(s)
Panganga/ Kalaw-kalaw/ Malapotiokan	*Diecocalyx cybianthoides* (A.P.C.) Mag.	Myrsinaceae	lumber, furniture
Dulitan/Sagasa	*Palaquim merrillii* Dub.	Sapotaceae	Lumber
Mosisi/Musizi	*Maesopsis eminii* Engl.	Rhamnaceae	lumber,firewood, ornamental
Kulasi/Malaruhat	*Syzgium nitidum* Benth	Myrtaceae	furniture, lumber
Lamakan/Sidi	*Malicope triphylla* (Lam.) Merr.	Rutaceae	Medicinal
Maniknik/Buga/ Sablot	*Palaquim tenuipatiolatum* Merr.	Sapotaceae	Furniture
Malataloto/ Kalamagan	*Pterocymbium macrocrater* Warb	Sterculiaceae	Source nectar
Tambulian/ Lambiloan	*Eusideroxylon zwageri* Teijam & Binn	Lauraceae	Medicines
Kalokoi/Hangilo	*Ficus callosa* Willd	Moraceae	Lumber
Ulaian/Olayan	*Lithocarpus llanosii* (A. D.C.) Rebol	Fagaceae	lumber, firewood
Balayong/Tindalo	*Afzelia rhomboidea* (Blanco) vid.	Caesalpiniaceae	post, wood
Bangkal/ Pangalawagon	*Nauclea orientalis* L.	Rubiaceae	lumber,wood, furniture
Kalingag	*Cinnamomum mercodoi* Vid.	Lauraceae	Medicinal
Igem	*Podocarpus imbricatus* R. Br.	Podocarpaceae	furniture, wood, panelling
Phil. Chestnut	*Castanopsis philippensis* (Blanco) vid.	Fagaceae	Food
Gasa	*Castanopsis javanica* *(Blanco)* A.D.C.	Fagaceae	lumber, firewood, food (fruit)
Hinuag/ Malakanyon	*Podocarpus philippinensis* Foxw	Podocarpaceae	furniture, panelling
Kulambog/ Palali/Katmon	*Dillenia philippinensis* Rolfe	Dilleniaceae	lumber, food (fruit)

members (two each from Kaatuan and Sungco) volunteered to assist in locating the tree species. Fruits and/or seeds available during the field visits were collected. Stem cuttings were likewise collected from selected tree species whenever available, and tested for coppicing and rooting abilities. The main criterion favored by the farmers in selecting the trees is mainly based on immediate use rather than sale. Farmers chose trees mainly for house construction followed by source of raw materials for furniture making and the least nutritional security, i.e., sources of edible fruits. Incorporation of these trees in the farming and agroforestry systems can relieve some of the pressure on the forest protective zones. This will also broaden the diversity of tree species choices. The work complements that which focuses on the evaluation and dissemination of current commercial species.

Participatory Contour Hedgerow Initiative

Continuous crop production on steep slopes in Mindanao induces annual rates of soil loss often exceeding 100-200 t/ha (Garrity et al, 1993). The installation of contour hedgerows reduces these losses by 50-95% and creates natural terraces that stabilize the landscape and facilitate further management intensification. These advantages have led to wide promotion of hedgerow technology by the DENR and the Department of Agriculture (DAR). But adoption has been poor, and installed hedgerows are usually abandoned. This is because the increased labor demands in managing tree hedgerows are not sufficiently compensated by the yield increases observed (ICRAF, 1997). An adoptable technology must have minimal cost to the farmer as well as to the public agencies supporting the program. We have been working with an indigenous practice: natural vegetative strips (NVS). These very simplified hedgerows are made by laying out the contours and allowing natural revegetation of the site (Garrity et al, 1993). We found that NVS have exceptional effectivity in soil conservation. They require minimal maintenance and require no outside source of planting materials. The NVS concept was included in our farmer-to-farmer training program conducted in collaboration with the DA. We subsequently observed that some 200 farmers adopted the technique, most of them on the basis of observing a neighbor's success. NVS technology seems particularly well-suited to vegetable farming systems because there is a little possibility of competition between the NVS and the crops. Over 100 farmers from three target buffer zone villages in Lantapan participated in a series of cross-visits to the ICRAF site in Claveria, Misamis Oriental, to observe NVS and other types of hedgerow systems, and to discuss with the Claveria farmers their experiences.

We responded to farmer interest by combining our technical expertise with the extension skills of a technician from the DA, and the practical knowledge of a motivated farmer adopter to provide meaningful extension services. This Contour Hedgerow Extension Team (CHET), composed of three individuals, initially worked with individual farmers who requested their assistance. This evolved into backstopping a peoples' conservation organization (Landcare Association) that took responsibility for technology dissemination. The approach has developed into a dynamic movement with 28 self-governing chapters, over 1000 members, and a municipal federation in Claveria (Garrity et al, 1998). Local government got involved in supporting the effort financially, with active involvement of the village leaders (a local-government-led process). The Landcare approach has been embedded in the Lantapan natural resources management plan. Currently about 75 farmers have established NVS systems on their farms in Lantapan. We will be testing the approach in collaboration with the Municipal Government, the Lantapan agricultural extensionists, and the Dept of Agriculture-NOMIARC. We look forward to scaling-up the method to the provincial and regional levels.

Indigenous Strategies to Intensify Shifting Cultivation

Since the end of World War II, high birth rates and heavy in-migration have dramatically increased land use pressures in the Lantapan watershed. In response, both Tala-andig and migrant farmers have been forced to modify traditional swidden practices into more exploitative versions. As fallows have shortened and cropping periods expanded, the ecological balance underpinning the sustainability of these systems has been lost, pushing them into a downward spiral of dwindling crop yields and degradation of the biotic resource base. During this intensification process, fallow successions have gradually evolved from secondary forest, to bush, and eventually to more pernicious floristic communities dominated by *Imperata cylindrica* and ferns. A wide band of this fire climax vegetation cuts across the mid-slopes of Lantapan's toposequence and is regarded as marginal for agricultural purposes. With decreasing returns to labor, farmers often abandon this degraded land and clear more forests further upslope with more fertile soils. It is this expansion ofdegraded land, and its subsequent abandonment, that has fueled much of the encroachment pressure on the forest margins of the Mt. Kitanglad Range Nature Park. Urgent solutions are needed to rehabilitate degraded lands on the park periphery and bring them back into productive cultivation.

Recently, scientists have begun to focus on the soil-enhancing properties of *Compositae* species and their potential application to intervene in declining swidden systems and intensify farming toward permanent cultivation. A sparse but growing body of literature has argued that *Chromolaena odorata* (Dove, 1986; Agbim, 1987; de Foresta and Schwartz, 1991; Field, 1991; de Foresta, 1993; Derpsch, 1993; Slaats, 1993: Baxter, 1995; Roder et. al., 1995), *Astroeupatorium inulifolium* (Stoutjesdijk, 1935; Cairns, 1994), *Tithonia diversifolia* (van de Goor, 1953; Verliere, 1966; Nagarajah and Nizar, 1982; Pandosen, 1986; Adchak, 1993; Baxter, 1995;) and other *Compositaes* are desirable spontaneous fallow species that may provide the biological basis for intensification of swidden systems. If fire control mechanisms are effectively implemented, these species have the reputation of being capable of replacing grass or fern vegetation. When introduced by seed or stem cuttings into recently abandoned dryland or burned *Imperata* / fern areas, these *Compositae* species form dense thickets within one year. Unlike other perennials that are being tested in trials searching for improved fallow species, a key attraction of the *Compositae* is their spontaneity. They are aggressive, pioneer colonizers that will dominate fallowed fields with minimal farmer intervention if conditions are favorable for their growth. The critical challenge is how degraded lands can be effectively rehabilitated by resource-poor farmers - thus mitigating agricultural pressure on the forest margins.

Farmer management of *Tithonia diversifolia* (widely known as wild sunflower) as a green manure crop is widespread among the Igorot in northern Luzon (Maslan, 1989; Bawang, 1995; Ferrer, 1996). Many Igorot migrants have brought this technology with them to Lantapan, and awareness of its agronomic potential has gradually diffused among the wider farming community. We found that *T. diversifolia* accelerates nutrient cycling and enable soil rehabilitation during an abbreviated fallow period, through its rapid growth, efficient scavenging of soil nutrients, copious leaf litter, and rapid decomposition (Cairns, pers. comm.). Sunflower hedgerows maintained around the swidden perimeter provide the seed source to facilitate rapid colonization during the fallow. A two-year fallow appears to be the norm, after which the sunflower biomass is easily slashed by bolo and mulched or burned. Farmers in the study area are manipulating wild sunflower as a biological tool to eradicate *Imperata* and rehabilitate degraded grasslands. In this case, stem cuttings are planted at intervals throughout *Imperata* swards, or alternatively, seeds are sometimes broadcasted. Farmers claim that at the end of the first year, the cogon is almost completely choked out and displaced by sunflower; by year two, the sunflower fallow can already be re-opened and a good crop grown without fertilizer inputs.

Although *T. diversifolia* is widespread, and reportedly similarly perceived by farmers in other equatorial regions, there is little empirical evidence available to validate its agronomic potential. Much information appears to be anecdotal and undocumented. We are investigating the hypothesis that *Tithonia diversifolia* can be managed by farmers to intensify bush-fallow rotations as a tool for rehabilitating degraded land. We are implementing a series of agronomic trials to test how farmers can best intervene to ensure that *T. diversifolia* will be the dominant succession species when land is fallowed. This research is based on the premise that strategic introduction and management of *Tithonia diversifolia* will allow even labor-short farmers to intervene in the downward spiral of land degradation and begin a gradual process of rebuilding soil properties. The controlled variables tested in the field trials will emphasize a minimalist approach; what are the least interventions that will still ensure strong establishment of *T. diversifolia* and achievement of the desired results?

This research links directly with a wider regional initiative that ICRAF is coordinating on indigenous strategies in fallow management. It will be included as one component of a set of parallel research projects in S.E. Asia aimed at better understanding indigenous fallow