PN-AEN023

The
FORESTRY PRIVATE ENTERPRISE INITIATIVE

The Economics of Extraction in Philippine Forests: When Timber Turns to Gold

By

Jan G. Laarman, Eden Jacosalem Stewart,
and Patrick C. Dugan

FPEI Working Paper No. 54

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Office of International Cooperation and Development
Forest Service, Forestry Support Program and
Southeastern Forest Experiment Station

Supported and funded by
Bureau for Science and Technology
Agency for International Development

FPEI Working Papers Series
June 1987

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The Forestry Private Enterprise Initiative (FPEI) is a cooperative project of the Southeastern Center for Forest Economics Research (SCFER) with the Forestry Support Program (FSP), the United States Agency for International Development (AID), Bureau for Science and Technology (S&T) [through its Office of Forestry, Environment, (and Natural Resources (FENR)], Organization for International Cooperation and Development (OICD), the United States Department of Agriculture (USDA) Forest Service Southeastern Forest Experiment Station (SEFES), and North Carolina State University (NCSU).

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Laarman, Jan G., Eden Jacosalem Stewart, and Patrick C. Dugan. 1994. The Economics of Extraction in Philippine Forests: When Timber Turns to Gold. Southeastern Center for Forest Economics Research, Research Triangle Park, NC. FPEI Working Paper No. 54, 26 pp.

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THE ECONOMICS OF EXTRACTION IN PHILIPPINE FORESTS:

WHEN TIMBER TURNS TO GOLD

Jan G. Laarman

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ABSTRACT

Compared with the extraction of timber, many projects to promote the production and marketing of non-timber forest products assume reduced environmental impact and favorable distributional consequences. On the other hand, timber can be a commercially important resource for rural communities.

The present analysis compares the income from harvesting timber and non-timber forest products in the Philippines. It draws from detailed profiles of forests and communities in three cases: Paranas in the typhoon belt of the Visayas islands, San Pablo in the uplands of northern Luzon, and Lianga Bay in a rugged hilly region of eastern Mindanao. Each case represents recently ended industrial timber concessions, where second-growth forests have potential for community forestry.

The matter of income generation is an empirical question varying with local circumstances. However, timber comprises a high proportion of forest assets and income potential in each of the three cases. In view of the private profitability of logging, a central issue is how to grant sensible timber cutting rights within a larger framework of forest protection and regeneration.

INTRODUCTION

The non-timber forest products (NTFPs), sometimes misleadingly labeled "minor" forest products, have substantial economic importance in temperate and tropical countries. Especially in the developing economies, many millions of people rely on forest-based plant and animal products for subsistence consumption and cash incomes. The term "extractive reserves" conveys the idea that certain forested areas should be managed mainly or exclusively for production of NTFPs. Originally associated with rubber tapping and Brazil nut collection in Amazonian

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forests (Schwartzman 1989; Allegretti 1990), the meaning of extractive reserves is by now far more generalized.

Proponents of extractive reserves generally believe that harvesting of NTFPs is less environmentally disruptive--and hence more sustainable--than harvesting of timber (Fearnside 1989; Peters et al. 1989). Secondly, local communities are the usual producers and beneficiaries of NTFPs, while outsiders often obtain the official rights to harvest timber. The dual assumptions of reduced environmental impact and favorable distributional equity explain hundreds of activities to initiate or strengthen the production and marketing of NTFPs in the developing world.

Yet recent reviews identify important limitations (May 1991; Browder 1992; Dove 1993; Richards 1993). Biological sustainability comes into question if NTFPs previously produced in low volumes suddenly are demanded in larger quantities. Frequently, market infrastructure for NTFPs is frequently poor in terms of transportation services. Sellers of NTFPs are vulnerable to buyer manipulations when markets are specialized, small, and ephemeral. Individuals who earn their livelihoods from NTFPs are often among the poorest of the rural poor, so that it may be difficult to argue that NTFPs lift the economic status of those engaged. To allow local people harvesting rights to NTFPs but not to timber, minerals, and other key resources may deny them opportunities for development and wealth. Thus upon closer inspection, much of the recent enthusiasm for NTFPs may be overstated.

The present analysis considers the income from harvesting timber and non-timber forest products in the Philippines, drawing on a general framework and three cases. The matter of income generation and distribution from different mixes of forest resources is an empirical question varying with local circumstances. The three cases represent distinctly different settings

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of communities in relation to forests. Yet the studies uniformly show that timber comprises a high proportion of forest assets and income potential.

HUMAN PRESSURES ON THE FOREST

Although data on Philippine forest cover are unreliable, the conversion of forests for agriculture, pasture, human settlements, and other land uses has been massive and unmistakable. Forest cover is about 20 percent of total land area in the early 1990s, compared with about 50 percent in 1950 (Kummer 1992). Of the present forest cover of perhaps five million ha, most is second-growth (residual) dipterocarp forest logged at least once. The remaining area of primary old-growth forests is small, probably less than one million ha, located principally on steep ridges and in inaccessible sites. These old-growth forests are officially protected from logging by a 1991 administrative order of the Department of Environment and Natural Resources (DENR).

Philippine deforestation has been driven by the combination of logging and subsistence farming within an inadequate institutional framework. In the post-war economy, the government granted timber concessions to commercial logging and wood-processing companies in the name of economic development. Hence in 1976 over 400 timber concessions covered two-thirds of the forest. Yet it is by now widely recognized that the government granted its timber harvesting concessions at very low prices, and that large profits were captured mainly by a few politicians and well-connected individuals (Cruz and Segura de los Angeles 1984; Boado 1988). Most timber concessionaires did not fulfill their responsibilities in post-logging forest management. Moreover, logging has caused extensive off-site sedimentation in important watersheds (Hodgson and Dixon 1988; DENR 1991). Because of both environmental problems and public perceptions of corrupt behavior in logging, considerable popular and political sentiment now favors a total logging ban (Wallace 1993).

The second force in deforestation is subsistence agriculture driven by rapid population growth and widespread poverty. Compared with other countries of Southeast Asia, the Philippines has the highest rate of population growth and lowest rate of economic growth (Krugman et al 1992). The modern sectors of the economy are too small to absorb the expanding population, and the majority of Filipinos remain trapped in subsistence-level farming, fishing, and petty services. Almost half of the agricultural population is landless, and land reform has been largely ineffective (Porter and Ganapin 1988).

Consequently, forestlands absorb the spillover. In the late 1980s, an estimated 8.5 million persons lived on public forestlands (DENR 1990). About two-thirds of this population comprise indigenous cultural communities. The remaining one-third are displaced lowland farmers who migrated to the uplands in search of lands to cultivate. While the land frontier supposedly closed in the 1960s, the area under cultivation continues to increase, mainly on forested lands considered "non-arable" (Garrity et al 1993).

Decades of logging and subsistence cultivation have left their mark on forest conditions. Satellite images for 1987 showed that 1.3 million ha of upland forests were under cultivation (mainly "kaingin," or shifting agriculture). Between 1970 and 1990, logging plus subsistence agriculture reduced the asset value of the country's dipterocarp forests by about 50 percent (DENR 1991).

According to statistics maintained by the Forest Management Bureau, legally recorded log production from timber concessions was 10.7 million cubic meters in 1970, falling to a mere 0.9 million cubic meters by 1992. However, recorded log production is only some fraction--likely about 50 percent--of total log production when also considering clandestine activity (DENR 1991).

Deforestation constrains not only log production, but also the NTFPs. The NTFPs of greatest commercial importance are indicated in Table 1. The Philippines produces substantial volumes of rattan furniture and handicrafts, and exports of rattan products were $200 million in 1990. Yet rattan sources are badly depleted, especially canes of large diameter (>2 cm). Government statistics on rattan extraction vastly understate actual removals, meaning that economic impacts are difficult to estimate. However, one study indicates that depletion of rattan is $122 million annually (McDermott 1992).

Various other NTFPs are under depletion pressures. An example is almaciga resin collected by certain tribal communities (Conelly 1985). Almaciga resin is used as a varnish by furniture manufacturers, but large numbers of almaciga trees are over-tapped or illegally cut for timber. Fuelwood, birds, monkeys, animal skins, and orchids are taken in high volumes, although much of this is illegal and beyond government control. In sum, the supply of virtually all NTFPs is diminished by the continuing fragmentation and degradation of forest habitat, while specific products are increasingly scarcer because of over-harvesting (McDermott 1992).

TOWARDS A PEOPLE-ORIENTED FORESTRY

In response to increasing public reaction to deforestation and resource depletion, the government of the Philippines is charged with defining and implementing new policy directions for forestry. Especially in the past five years, a number of high-level policy reviews debate competing ideas to put Philippine forestry on a more sustainable pathway. Two leading elements in this discussion are community-based forestry and the possible prohibition of logging.

In the Philippines, support for community forestry reflects increasing opinion that forestry should be designed for the needs of local rural people. Already in the early 1970s, the Ikalahan tribal community in Luzon was granted the first Communal Forest Lease to help fend off land encroachment by outside interests. By 1988, nine communal leases ranging widely in

size had been issued to a variety of groups (Garrity et al. 1993). In recent years, the DENR has developed additional types of lease agreements to include Community Stewardship Contracts, Forest Land Management Agreements, and Community Forest Management Agreements. In intent, each form of agreement allows forest occupants and upland farmers to extract forest products in exchange for the community's commitment to forest protection.

Despite understandable confusion about these different institutional arrangements, community-based forest management enjoys strong popular endorsement. The logic for this is straightforward and emotionally compelling. If large-scale timber concessions destroyed the forest, then they should be eliminated. In their place, forests should be managed by local communities. Two reasons are put forward in support of this position: (i) communities have direct incentives in the long-term protection and productivity of the forests around them, and (ii) many forested areas are homelands of indigenous cultural communities, so that justice is served by recognizing their rights to the land.

A second element of debated strategy is whether to totally prohibit logging. This is highly controversial. In 1993, 60 of the country's 75 provinces had implemented logging bans or moratoriums through a variety of administrative directives. At the national level, the Philippine Congress has for several years studied draft legislation to prohibit logging. The proposed legislation raises complex questions about economic impacts, job losses, and ability to restrain illegal logging. Moreover, prohibiting logging is a doubtful proposition to save forests if nothing is done to address uncontrolled shifting agriculture (Wallace 1993).

An unresolved question of central importance for present purposes is to reconcile community-based forestry with the prospect of logging prohibitions. These two strategic directions--both very prominent in current discussions--do not conflict if community-based forestry is to rely on NTFPs. On the other hand, an inconsistency is present if timber will play a

role in community forestry. Significantly, the first economic test of community-based forestry was the Central Visayas Regional Project (1984-89), where community income was derived mainly from labor-intensive logging. Despite problems with organization and management, the CVRP was considered an overall success (Garrity et al. 1993).

Even if a qualified success was realized in the CVRP, many individuals in government and the capital-based segment of the forest products industry resist linking communities with logging. Some government officials argue that community-based timber cutting, if dispersed among small operations all over the country, will further complicate the control of illegal logging. Other skeptics contend that communities do not have technologies for logging. However, this is refuted by the fairly common presence of carabao (water buffaloes) and labor-intensive methods in both legal and illegal logging, precisely the technology appropriate for many low-income communities (Laarman et al 1981). Yet a third and highly patronizing attitude contends that communities might make too much money from logging, leading to profligate spending!

More generally, the operational framework for community forestry is still so new that it draws a number of immature proposals. In the Philippine Senate, some legislative proposals to ban logging attempt to distinguish between commercial enterprises and community organizations. In the proposed law, commercial enterprises may not engage in logging. However, logs may be legitimately harvested by communities if they do not generate profits, or if forest products are not sold. That is, community logging should be "non-commercial." From the perspective of improving community welfare and using scarce forest resources efficiently, this proposition is difficult to rationalize.

The feasible scale of community forestry is another unresolved question. Under the Master Plan for Forestry Development, a total of 1.5 million ha is the target for community-based forest management (DENR 1990). Yet by 1993, only 40 communities had actually

entered into Community Forestry Management Agreements, representing under 100 thousand ha. of forestlands. At this scale of activity, about 600 communities are needed to meet the target defined in the Master Plan. The extension, training, and other technical inputs to serve this many communities raise obvious concerns about Master Plan targets.

The management decisions for community forestry vitally depend on forest inventories and supporting financial and social data. Most community forestry seems destined for second-growth forests of unknown stocking and condition on canceled or expired timber concessions. Despite several national forest inventories in the Philippines, remarkably little data can be located, with data disappearance possibly explained by attempts to hide the extent of deforestation (Kummer 1992). Moreover, the usual forest inventory of the past merely enumerated the principal timber trees in a strip cruise, and often by ocular estimates without attempts at measurements. Finally, the matter of harvesting timber or NTFPs requires feasibility analysis. The viability of community forestry is determined by resource stocks, prices, and production costs.

THREE CASES

Beginning in 1991, the DENR--with external technical and financial assistance--began testing a more comprehensive process for forest inventories and planning. A few pilot areas were chosen to represent varying physical and social conditions in second-growth forests. Forest inventories were designed to produce biophysical, social, economic, and institutional profiles of the pilot areas in question. On a trial basis, the inventories and associated profiles were contracted to private consulting firms, called Forestry Service Organizations (FSOs). The rationale for contracting FSOs is objectivity, and a possible savings in cost and time compared with retaining these functions in government.

The field teams of the FSOs reported on the stocking and consumption of timber and NTFPs in and adjacent to forested areas. Additionally, they surveyed and recorded locations and activities of forestland occupants, presence of environmentally sensitive zones, occurrence of rare and unusual species, and attitudes of local residents about forestry alternatives. Total costs for the inventories, profiles, and management planning average about US$30 per ha, a modest amount in relation to forest asset values.

The data generated through these pilot exercises illuminate the production alternatives for community forestry. Three cases discussed in this paper are Paranas in the typhoon belt of the Visayas islands; San Pablo in the marked wet-dry climatic region of northern Luzon; and Lianga Bay in a part of eastern Mindanao where rainfall is quite even throughout the year (Figure 1). Each case represents recently ended timber concessions, where second-growth forests have potential for community forestry. The cases are revealing for what they indicate about the comparative income potential of timber and non-timber resources.

Paranas

With a population of 28 thousand people, the municipality of Paranas is the third largest on the island of Samar. Main sources of livelihood are fishing and farming. Forest-based extraction is concentrated in six barangays (local government units) nearest the forest. There are no indigenous cultural communities within the project area, although tribal groups are involved in kaingin (shifting cultivation) nearby.

The pilot area is a block of 2,100 ha of public forestlands bounded on all sides by other public forestlands. Terrain is moderate to rugged, broken by a few steep and rocky ridges. Elevation is 200-300 meters above sea level. The region is located within the typhoon belt, and has no distinct dry season. Very heavy rainfall occurs from November to January.

The area had been logged in 1987-89 by the San Jose Timber Company, but the company's timber concession was terminated because of a logging ban covering the whole region. After imposition of the logging moratorium, the area became vulnerable to timber poaching, facilitated by the good road network left behind by the company. Timber poachers use chain saws to fell trees and cut them into flitches and planks, which are transported from the forest with the help of carts and sleds pulled by carabao (i.e., water buffaloes). Both timber poaching and kaingin are plainly visible in the project area.

The biophysical inventory showed that 81 percent of the area is covered with operable second-growth forests. The predominant tree vegetation consists of lowland and lower hill dipterocarp species such as mayapis (Shorea squamata), red lauan (Shorea negrosensis), tanguile (Shorea polysperma), almon (Shorea almon), and yakal (Shorea guisok). The inventory indicated 48 families and over 1,000 tree species for just the 2,100 ha.

Also found during the inventory were 10 species of rattan, eight species of erect palms, and one species of bamboo. The commercially most important NTFP is abaca, whose fibers are made into ropes and handicraft products. Pandan, used for making mats, is abundant. The resin of almaciga (Agathis philippinensis) is being intensively tapped as a raw material for varnishes, even though this activity is illegal because of girdling damage to the trees. Other NTFPs are firewood, useful vines, edible rootcrops, medicinal plants, herbs, and orchids. Wild pig and deer are the game animals most commonly hunted.

Completion of biophysical and socioeconomic inventories was followed by a financial analysis of enterprise alternatives for the pilot area. Under the community forestry model, several enterprise opportunities were identified. Each prospect was profiled in detail, drawing upon the best available data regarding sustainable production, market outlets, required inputs,

and prices. Table 2 summarizes results for the "base case," which employs a time horizon of 25 years, a discount rate of 12 percent, and operation of seven different enterprises.

The overall project has net present value of US$1075 thousand (before fixed costs), of which logging contributes 46 percent. A small plant to produce woodwool is financially attractive, but requires an investment of $82 thousand and substantial technical and managerial inputs. Timber stand improvement (TSI) is estimated to generate a modest flow of raw material for construction materials and woodwool production. Agroforestry refers to fruit trees interplanted with timber trees near population clusters. Handmade paper is increasingly popular as stationery, greeting cards, folders, dolls, and other novelty items. Pandan leaves are used to make cocooning frames for the growing sericulture business in the Philippines, as well as for export to other Asian silkworm producers. Finally, rattan is already being grown on a small scale in the Paranas area, and the analysis team concluded that Paranas communities can reasonably establish another 50 ha of rattan.

Most significant about the Paranas study is the finding that both timber and non-timber products are currently poached indiscriminately, and that future options should emphasize value-added enterprises. Of the many enterprises considered, none can match the income potential of logging in the second-growth forests.

San Pablo

Another pilot area comprises second-growth forests within the municipality of San Pablo, province of Isabela. The forestlands had been part of two timber concessions which ended in 1991 and 1992. Three barangays residing in and around the area rely heavily on forest resources for cash and subsistence income. Most of the households (84 percent) are farmers by occupation.

The residual forest stands, particularly adjacent to the remaining virgin forest, are in good condition. However, volumes of standing timber throughout the area are low. As new residents move farther into the uplands, kaingins are becoming increasingly widespread. The most recent kaingins are particularly destructive. Standing trees are either cut down or girdled with no further utilization. This is possibly because transportation costs of removing logs are high. The area is accessible by vehicle only during the dry season, and the barangays are 16-25 km from the national road.

The ethnic composition of the three barangays is Ilocano (61 percent), Ibanag (31 percent), Ifugao (5 percent), and Tagalog (3 percent). The Ilocanos and Ibanags are natives of the area. The Tagalogs moved to San Pablo through marriage, while the Ifugaos migrated in because of poor agricultural lands in their home areas. None of the ethnic groups is a forest-based indigenous cultural community. Rather, increasing extraction of forest products is explained by the degradation of existing farm lands, and the shortage of other sources of livelihood.

To profile their production and consumption of forest products, detailed interviews were conducted with 20 households in the barangay of San Vicente (known as Tupa to the local residents). Tupa's population is 1,214 persons in 232 households. The community has no electricity, telephone service, or running water. The forest is five hours from Tupa by foot, although some residents ride their carabaos and carry food supplies for one or two weeks.

The collection and marketing of forest products occurs through complex economic exchanges. Several households in Tupa own chainsaws, which they use themselves and rent to neighbors. Chainsaw owners are knowledgeable about payoff period (1-2 years), maintenance costs, and aspects of owning versus renting. Various business arrangements bring together chainsaw operators, wage laborers, and working capital.

Logging is illegal, since the residents of Tupa do not have government permits to sell wood. However, government regulations are circumvented by transporting only small volumes, and by bribing military and government officials. Thirdly, some wood buyers drive to Tupa to pick up logs. This means that while Tupa log sellers receive lower prices, the risks of being apprehended are shifted to log buyers.

Rattan is the second main cash-earning forest product for Tupa. Rattan gathering and marketing is a new trade in the barangay. Its marketing relies on dealers (middlemen) who borrow money from rattan buyers, and who then lend money to rattan gatherers. The rattan gatherers are obligated to sell rattan to their creditors.

In Tupa the principal producers of forest products are men, although a few women engage in firewood gathering and rattan dealing. Most survey respondents report that bamboo, firewood, lizards, and fish are easy to obtain. Scarcer are deer, wild pigs, and rattan.

Table 3 summarizes the timber and non-timber products produced and consumed by the 20 surveyed households. Using methods described elsewhere (Stewart 1990), the products consumed by households were valued with shadow prices. For example, forest meat and fish were valued in relation to mongo beans (vegetable protein) as an indirect substitute. The people of Tupa consider wild pig, wild chicken, deer, and fish as preferred foods. These foods carry shadow prices higher than the market price of mongo beans. In comparison are foods less culturally accepted such as lizard, monkey, birds, and wild cat--all of which carry lower shadow prices. Products used for household construction and repair (e.g., bamboo, rattan, and sawn timber) were valued in relation to market sales foregone, adjusted for quality differences. Households keep the least saleable products ("rejects") for themselves, so that shadow prices of these materials are very low.

For the forest products sold commercially in year 1992, sawn timber constituted 78 percent of gross sales revenue, and 72 percent of net revenue after expenses. Adding in subsistence products valued at their shadow prices, timber is 77 percent of gross production value, and 70 percent of net value.

Lianga Bay

In late 1992, the DENR canceled the timber concession of the Lianga Bay Timber Company. This concession covered 59,000 ha in the province of Surigao del Sur, southeastern Mindanao. Over 900 employees lost their employment when the company stopped its logging operations, plywood factory, and sawmill. The concerned municipalities felt an immediate decrease in local government revenues. Depressed economic conditions threatened local peace and order. For these reasons, the provincial governor joined the church bishop and local mayors to petition for restoration of timber cutting.

The government responded to these petitions by granting transfer of the timber concession to the Christine-Diatagon Multipurpose Cooperative (CDIMCO), owned by the former employees of the Lianga Bay Timber Company. The CDIMCO had been a consumers cooperative, and now faces the complex task of transforming itself for forest management and harvesting.

The CDIMCO is preparing a 15-year resource management plan for the entire area. In the interim, CDIMCO is logging 700 ha of second-growth forest for 1993-94, and has been granted permission to transport and sell a modest quantity of logs cut by the former concession holder. This provides operating capital to repair roads and bridges. These repairs, along with log skidding and hauling, are provided by the cooperative's labor using leased equipment.

For the future, CDIMCO confronts major challenges. First, it has assumed responsibility for payment of back wages and retirement benefits left unpaid by the company which preceded it. Secondly, a feasibility analysis is needed on the technical and financial viability of resuming operation of the currently idle plywood plant. Additionally, CDIMCO requires an administrative system for its forestry and logging operations to include methods and procedures for accounting, reporting, and profit sharing.

Regarding logging technology, the former employees who now own CDIMCO have experience only with capital-intensive methods. Their initial operations rely on mechanized logging using rented equipment, even though consultants to the project recommend that CDIMCO should shift to labor-based methods and carabao log skidding. However, it will demand considerable education and training of CDIMCO's workforce to implant "primitive" labor-based logging.

At CDIMCO, the harvesting of NTFPs is controversial. Two indigenous cultural groups, the Manobos and Mamanwas, have been collecting rattan and wild abaca for cash incomes, but without government permits. Under its agreement with the DENR, the cooperative is obligated to prevent all unauthorized harvesting of forest products. Hence forest guards employed by CDIMCO have stopped the Manobos and Mamanwas from extracting and transporting rattan and abaca. This causes resentment, since the tribal leaders interpret CDIMCO's interference as a transgression of their ancestral rights. Although CDIMCO expresses intentions of helping the Manobos and Mamanwas obtain legal harvesting rights and fair prices for NTFPs, the current relationship is strained by hostility. The problem is one of competing communities, a workers' community and an indigenous community, both of which claim forest harvesting rights.

DISCUSSION AND CONCLUSIONS

The point is frequently made that "minor" forest products are major, particularly in low-income countries. The Philippines presents a valid empirical test of this proposition in light of ongoing forest inventories and community profiles. The focus is second-growth forests, i.e., those logged at least once, which by now comprise most of the country's remaining forest cover.

The most widely collected NTFPs in second-growth forests of the Philippines are rattan, bamboo, firewood, resins, orchids, medicinal plants, and a variety of fish and game. Non-timber products contribute significantly to the livelihoods of communities studied in Paranas, San Pablo, and Lianga Bay. Yet despite past lapses in forest management by the timber concessionaires and years of encroachment on the public forestlands, timber is by far the most valuable asset in each of the three cases examined.

The story can be told in relation to monetary returns from a single tree. A dipterocarp tree of 60-70 cm in diameter at breast height generally yields 3-5 cubic meters of saleable timber. Log selling price is highly variable by species, size, grade, and location, but averages about 2-3 thousand pesos (US$80-120) per cubic meter (Mendoza 1993). Subtracting log transportation costs and expenditures for carabao logging, the net value of production is about half of log selling price. Thus each utilizable tree generates about US$120-300 in net returns. Returns fall if the government is able to capture its forest charges (25 percent of log selling price). Even then, the log producer makes US$60-150 per tree.

Thus in relation to the modest incomes of rural Filipinos, which average US$630 per capita per year, timber is "green gold." The cutting and sale of just a few trees generates income equivalent to the yearly earnings of most families. It is easy to understand why individuals risk illegal logging, particularly when penalties have been light.

In view of the private profitability of logging, the central issue for government programs in community forestry is how to grant sensible timber cutting rights within a larger framework of forest protection and regeneration. There is little hope of protecting watersheds and areas important for biodiversity unless communities are given legal and orderly access to the forest's principal commercial asset. Workable strategies will concentrate on multiple-use forest management, with all of its complexities. They will need to incorporate the kind of environmental safeguards prescribed in the forest management plan for Paranas: road and trail construction during dry seasons, tree marking and directed felling, establishment of "ecological zones," tree planting and assisted natural regeneration, and enforcement of regulations on stream buffers and wildlife protection. While foresters have been chided for paying too much attention to timber, it is equally possible to err in the other direction.

ACKNOWLEDGEMENTS

The cases discussed here are part of the Natural Resources Management Program, managed by the Philippine Department of Environment and Natural Resources, with technical and financial support from the U.S. Agency for International Development and the company Development Alternatives, Inc. Ernesto Guiang and Timothy Stewart graciously furnished explanations on inventory data and socioeconomic assessments for Paranas and San Pablo. Eight field crews worked diligently for months to obtain the data briefly summarized in this article. William Hart, Evan Mercer, Kevyn Wightman, Michael Jacobson, and Masatoshi Endo made useful comments on an earlier version of this manuscript. The authors acknowledge with gratitude the many persons who directly and indirectly contributed to the effort. However, the interpretations presented in this article are theirs alone, and should not be attributed to persons or agencies cited here.

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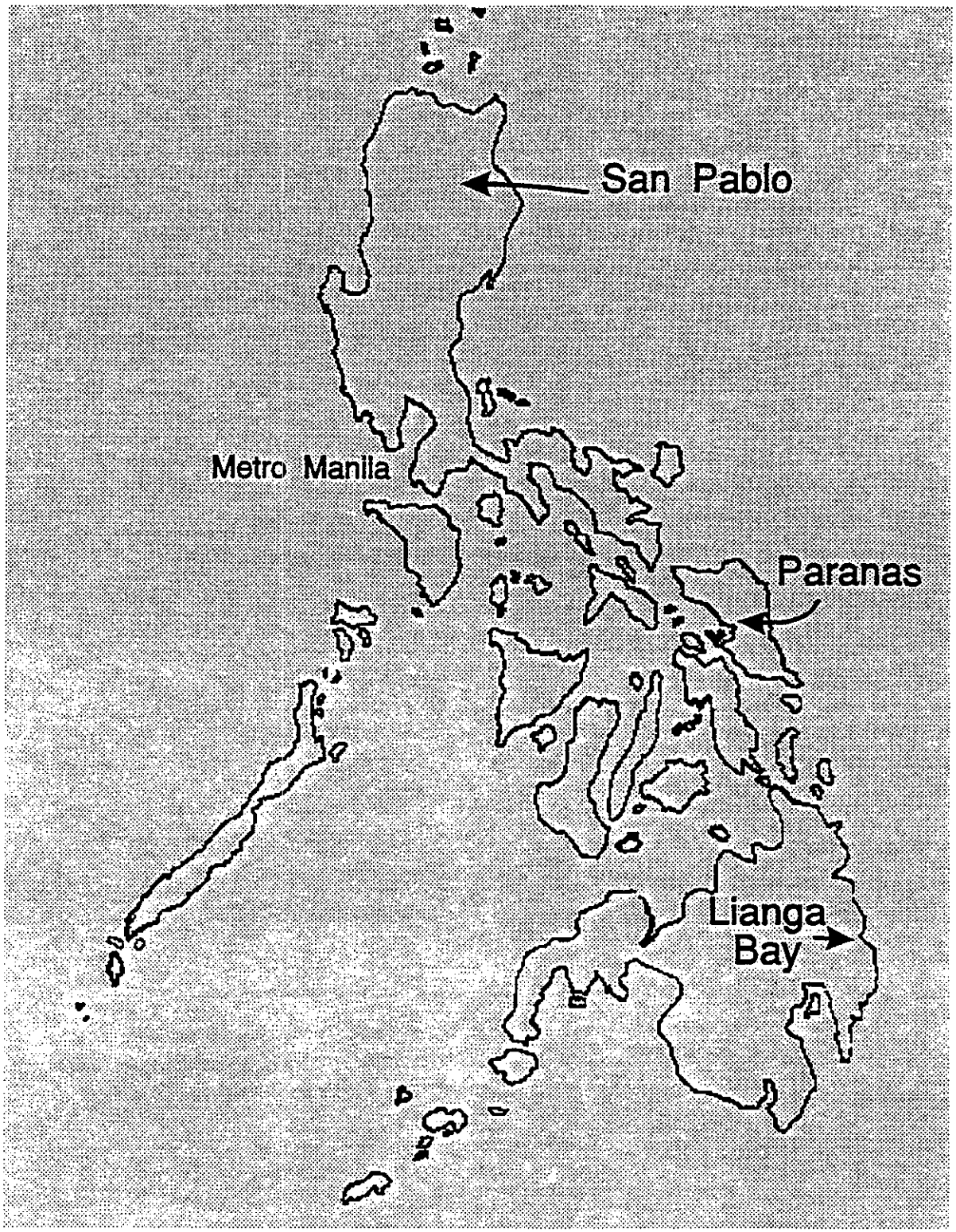

Fig. 1. Map showing location of three pilot exercises in forest management planning.

Table 1. Non-Timber Forest Species of Commercial Value in the Philippines.

COMMON NAME	SCIENTIFIC NAME	USE
Almaciga or Manila copal	Agathis dammara or A. philippinensis	Exported for high grade paints, varnishes; locally used for incense, torches, soaps
Anahaw	Livistonia rotundifolia	Thatch, handicrafts, fish pens, foods (buds and nuts), fuelwood & charcoal
Balao resin from apitong & other Dipterocarps	Dipterocarpus randiflorus and others	Resin used for varnishes, paints, caulking boats
Bamban	Donax cannaeformis	Bast fibers woven into handicrafts, ropes
Bamboo	Bambusa spp., Dendrocalamus spp., others (8 commercial spp.)	Construction, furniture, handicraft, banana props, fishpens
Buho	Schizostachyum lumampao	Thin-walled bamboo used for walls, papers
Buri	Corypha elata	Furniture, construction, handicrafts, buri braids, buri raffia (fine fibers for weaving), hats, food, alcohol
Hagnaya or diliman	Stenochlaena palustris	Stem of fern woven into handicrafts, cloth
Hingiw	Various vine species in the families Apocynaceae & Ascelepiadaceae	Used for tying purposes and handicrafts
Ilang-ilang	Canangium odoratum	Fragrance
Lumbang (baguilumbang) oil	Aleurites moluccana (A. trisperma)	Wood oil used in paints & varnishes (once exported)
Manila elemi or brea blanca, from piling liitan	Canarium luzonicum	Resin used locally for caulking, torches; major export for varnishes
Medicinal plants	e.g., Cinchona	Bark used to make quinine
Nipa	Nypa fruticans	"Nipa shingle" palm fronds for thatching; sap for alcohol
Nito	Lygodium japonicum	Stem used in weaving handicrafts
Ornamental plants	Various, e.g., Orchidaceae	Sold on the domestic and export markets
Pandan	Pandanus spp.	Mats, hats, decor, frames for silk cocoons
Pili	Canarium ovatum	Nuts, now largely from plantations
Rattan	9 Calamus & 3 Daemomorops	Furniture, handicraft, baskets, traps, cordage, food, dyes, medicine, etc.
Rattan	Wikstroemia spp.	High-grade fiber used for cloth, twine, money
Salago	Thysanolaena maxima	Brooms
Tanbark (from kamachile & mangroves: esp. bakauan)	Pithecelobium dulce & mangroves, esp. Bruguiera spp.	Tannin extract for tanning leather, local uses (preserving nets, etc.)
Tiger grass	Thysanolaena maxima	Brooms
Wildlife and wildlife products, e.g., Phil. long-tailed macaque	Vars. (e.g., Maccaca fascicularis)	Sold in domestic and export markets as specimens, leather, furs, pets, research animals
Woodfuel	Various spp.	Fuelwood and charcoal

Source: Melanie J. McDermott, "Non-Timber Forest Resources", Natural Resources Management Program, Report 92-5, Department of Environment and Natural Resources, Philippines.

Table 2. Summary of Established Financial Returns from Pilot Area in Paranas, Philippines.

OPTION	NET PRESENT VALUE AT 12% DISCOUNT RATE (thousand pesos)
Commercial logging[1]	12,982
Woodwool cement board[2]	8,223
Timber stand improvement[3]	3,544
Agroforestry[4]	1,681
Handmade paper[5]	868
Pandan cocoon frames[6]	439
Rattan plantation[7]	214
TOTAL	27,951

Exchange rate: P26 = US $1.00

[1] On 850 ha of operable forest divided into five management units. Target extraction is 30 cubic meters (cum) per ha on average of 34 ha per year. Estimated regrowth is 3.5 cum per ha/yr. Logging cost is 660 pesos/cum based on 4.1 person-days for chainsaw felling and hand sawing into flitches, 0.75 person-day for hauling to roadside by carabao, and 40 pesos/cum for fuel. Recovery rate is 0.75 cum of flitches per cum of logs. Labor is priced at P105 per person-day; carabaos are priced at P250 per day (rental).

[2] Shredded wood, portland cement, calcium chloride accelerator, and water. The product substitutes for tiles, hollow concrete blocks, and plywood and particleboard. It has a large demand in the Philippines.

[3] Target area is 170 ha/yr. TSI output is 20 cum/ha, of which 10 cum/ha is acceptable for sawnwood and rest is used for woodwool. TSI material is priced at P1500/cum for sawnwood; P400/cum for woodwool.

[4] Target is 33 ha to be developed over three years. Ratio of timber trees (yemane and mangium) to fruit trees (jackfruit and calamansi) is 80-20.

[5] Total investment is 78 thousand pesos. Mechanical and chemical processes are used to separate fibers, pulp and rinse them, and form and dry sheets of paper. Workforce is one supervisor, three pulpers, and two helpers who produce 74 kg of paper daily.

[6] Rectangular frames measure 30 x 530 x 390 mm to accommodate 156 silkworms. Pandan leaves must be mature and 13-15 cm wide. Leaves are collected, dried, pre-pressed, hot-pressed, trimmed to size, slotted, assembled, and sewn together on a sewing machine.

[7] Target is 50 ha developed in three years, with cost and yield data estimated from "The Philippines Recommends Rattan."

Table 3. Production of Timber and Non-Timber Forest Products by 20 Households of Tupa, Philippines, in September 1992[a].

PRODUCT	UNIT	SOLD FOR CASH			HOUSEHOLD SUBSISTENCE		
		Price	Annual Volume	Net Revenue	Shadow Price	Annual Volume	Net Value
Timber	Board Foot	16	117,900	323,018	1.50	19,430	19,600
Rattan	4 m Pole	1.40	230,320	87,150	0.50	52	26
Bamboo	4 m Pole	6	5,625	33,750	3	820	2,460
Wild Pigs	Kilo	50	108	5,380	25	208	5,145
Deer	Kilo	45	45	2,025	20	76	1,520
Fish	Kilo				20	151	2,990
Wild Chickens	Kilo				20	4	80
Wildcats	Kilo				10	20	200
Lizards	Kilo				10	27	270
Birds	Kilo				10	115	1,150
Monkeys	Kilo				10	60	600
Herbal Medicines	Dose				1	6	6
Firewood	Cubic Meter				8	101	808
Orchids	Piece				1	15	15
Totals				451,323			34,870

[a] Prices, net revenue, and net value in Philippine pesos (P26 = US $1.00).