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POPULATION PRESSURE, DEFORESTATION, AND COMMON PROPERTY INSTITUTIONS: AN OVERVIEW[1]

By

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I. INTRODUCTION

Attempts to address the problem of deforestation in the developing world are often undermined by rapid population growth. It is currently estimated that more than six million hectares of closed moist tropical forests are lost each year primarily through conversion to forest farming (FAO 1984; WRI 1991; Miller et al. 1991). Because many of these lands have steep slopes and thin topsoil layers, they are susceptible to damaging soil erosion. When migrants initially colonize forest lands, productivity may be high, but yields progressively decline after two to three years of continuous cropping. A cycle of population pressure, resource degradation, and poverty evolves as intensive cultivation leads to deteriorating land productivity, denying migrants the secure livelihood they originally sought by settling in forest lands.

Thus, among the elements in strategies for controlling deforestation, increased attention has recently turned to the relationship between population pressure and the local institutions that govern resource use. This can be complex. Population pressure may contribute to institutional change or lead to conflicts among users.

This paper does not discuss the issue of whether population growth can be viewed as a direct cause of institutional change

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2Assistant Professor, Institute of Environmental Science and Management (IESAM), University of the Philippines at Los Banos (UPLB); this paper is based on the report Population Pressure in Tropical Developing Countries, written by the author while she was Visiting Scholar at the Population Reference Bureau (PRB); a copy of this report can be obtained from PRB, 1875 Connecticut Ave, N.W., Suite 520, Washington, D.C. 20009 USA. The author wishes to thank PRB and the Andrew W. Mellon Foundation for funding the study.

that leads to forest degradation. Clearly there is a relationship but the evidence shows that many underlying factors contribute to environmental stress. The major factors often cited are: (a) inadequate government policies that encouraged excessive logging and opened up logged-over areas to migrants; (b) inequitable land allocation and taxation that promoted commercial exploitation of forest resources, making the uplands attractive migration destination areas; (c) lack of government programs, capital, and technology for intensifying agricultural areas, thereby inducing cropland expansion into marginal sites; and (d) extreme land concentration, inducing millions of rural landless households to open up arable farm plots in forested areas (Repetto and Gillis 1988). The worldwide debt crisis aggravated the impacts of these factors on deforestation by creating the conditions that promoted widespread unemployment and poverty, the primary sources of "migratory push" to forest lands.

However, population change remains an important intervening factor in tropical deforestation. If population grows unchecked, the result will be forest degradation at rates that are much faster than society's ability to respond through economic and institutional reforms (Repetto and Holmes 1983). A population's age structure provides an important link between current and future demands for job creation and social services. Another critical link is the impact of changes in the demographic structure of key population sub-groups, such as rural landless workers, ethnic minorities, and women-headed households. Population growth rates and migration patterns of these sub-groups differ markedly from the average and may require separate attention. Lastly, population movements into forested areas determine the geographical distribution of demand for forest resources. When forest land migration is analyzed over a long time period, the results reveal increasing pressures on forest resources that may correspond with significant changes in the economy, government policy, and local institutional arrangements governing access to resources.

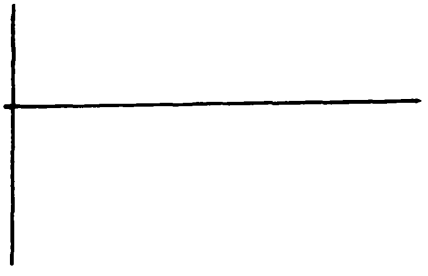
Because the connections between population growth, resource use, and forest degradation are too complex to permit straightforward generalizations, an approach to evaluating some possible interactions is suggested in Diagram 1. The impacts of population change factors are exacerbated by fundamental causes of forest degradation. Specific population sub-groups are especially vulnerable to changes in population size and government policies that define access to forest resources. These sub-groups — landless, rural migrants, ethnic mountain tribes, and women-headed households — are in turn constrained by poverty and demographic stress to overuse resources.

The challenge to governments is to devise programs that will control population pressure by counteracting incentives that induce frontier migration, including more effective population

DIAGRAM 1

POPULATION-ENVIRONMENT-PROPERTY REFORM

RELEVANT DEMOGRAPHIC FACTORS
- population size and growth rate
- increasing labor force and unemployment
- increasing migration to forest lands



FUNDAMENTAL CAUSES:
- economic stagnation
  - poverty
  - unemployment
- inappropriate policies
  - inequitable land distribution
  - excessive logging

POPULATION SUB-GROUPS

Landless Migrants	Ethnic Tribal Groups	Women-headed Households

MEDIATING FACTORS
- population programs and social services
- economic development and poverty alleviation
- property reform (common property)

FOREST DEGRADATION

programs and social services. A basic approach is to introduce widespread economic development and poverty alleviation. Another program is to develop alternative institutional approaches to promoting greater access to resources, such as property reform and support of common property institutions.3

This paper Mill address some of the links among poverty, population, and the institutional arrangements that contribute to the eventual breakdown of forest resources. It turns first to the regional pattern of deforestation and population growth in the tropics then focuses on a case study of increasing upland migration in the Philippines. Next, the effects of institutions and property rights are evaluated in terms of three propositions governing the use of forest resources. The final section provides some broad policy implications.

II. POPULATION PRESSURE AND DEFORESTATION TRENDS

There are at least four key demographic trends that influence patterns of deforestation in tropical developing countries. The first three trends have indirect implications for deforestation while the last, increasing upland migration, has a direct impact on forest land use.

1. Rapid Population Growth

Despite declining annual population growth rates, an increasing number of people each year will continue to exert pressure to deforest for croplands well after the close of this century. Agricultural production, particularly among the poorer regions of the world, is not growing fast enough to meet increased demand. As early as 1975, the Food and Agriculture Organization (FAO) estimates that almost two-fifths of the Earth's land area, or 2.5 billion hectares, contained more people than could be fed at low level of agricultural inputs. Between 1979-B1 and 1986-87, for example, global cereal production per capita declined in 51 out of 94 developing countries surveyed by the FAO.

Because of increasing population, arable land per person fell during the eighties at a rate of 1.9 percent per year. Cropped area per capita declined from 0.31 hectares in 1985 to

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3The application of this framework varies by country. Additionally, there will be different measures or indicators of population pressure.

0.28 hectares in 1989, or a yearly decline of 2.6 percent (WRI 1989, 1991).

Cropland expansion has been at the expense of forests. Cropland encroachment on tropical forests amounted to more than 90 percent of total deforestation or 11.7 million hectares worldwide (Myers 1991). In many countries, the remaining potentially arable lands lie in or near forest reserves that have steep slopes and thin topsoils and are thus prone to erosion (Gilland 1983).

Rural populations benefit greatly from forests. Direct forest users clear patches of forested, areas for cultivation and cut existing trees and other vegetation for timber, fuelwood, and other uses. As of 1985, more than 1.4 billion of the world's rural population are found in or around tropical forest sites, at an average forest land distribution of 1.23 hectares per person.4

As shown in Figure 1, assuming no depletion takes place between now and year 2025, there will be dwindling forest resources per capita primarily because of population growth. In Latin America, for example, forest area per capita will fall to 5.6 hectares, but if the low population projections are used, available forest area increases to 6.3 hectares per capita.

Because of the large population base in Asia, even with low population projections, forest area per capita is less than 0.3 hectares. The changes are more dramatic when current deforestation rates are allowed to persist. Asia's forests will almost be depleted by year 2000.

In contrast, in Africa, the gains from fertility control approximate half a hectare per person. If no reform is instituted in the forest sector, but population growth is checked, the gains in per capita forest area are not as large as in the zero-depletion case. These simple calculations support the need to develop both population control programs and forestry sector reform.

Country Comparisons of Population Growth and Deforestation

Each year between 6.5 to 15.7 million hectares of forest lands are cut, cleared, burned, and finally converted for cropping, grasslands, or fallow in just 21 countries where yearly deforestation rates are over 90,000 hectares (see Annex). Brazil

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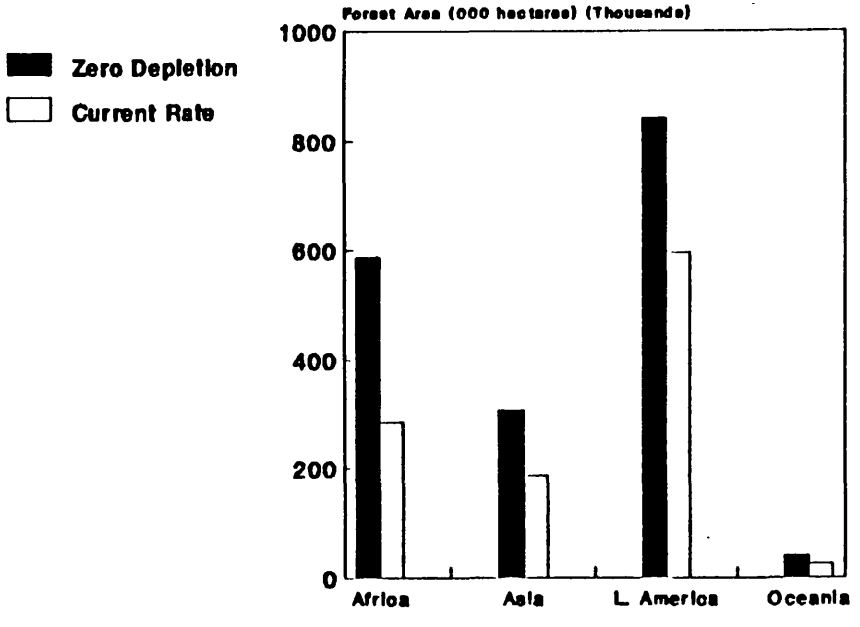
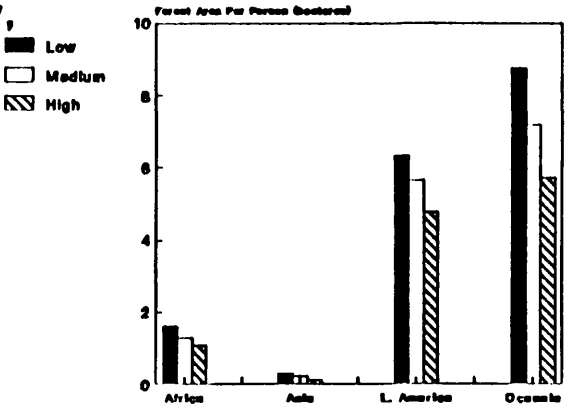
4Asia contains 74 percent of the population but only 17 percent of forest land area. As a result, less than a third of a hectare of forest land is available per person in the region.

FIGURE 1

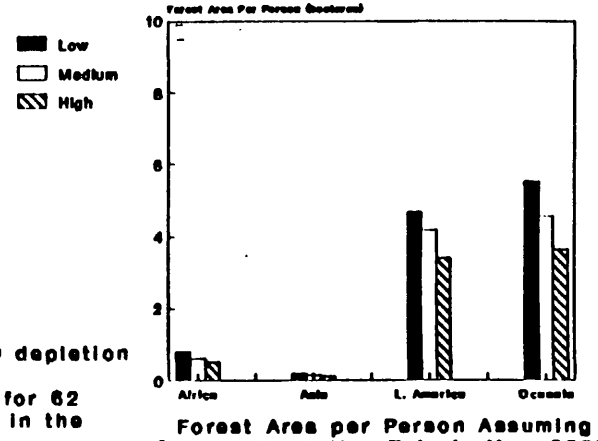
Projections of Forest Area and Per Capita Forest Area to Year 2025 Using Two Assumptions and Low, Medium, and High Population Projections in Tropical Developing Countries By Region



Projected Forest Area in Year 2025 Using Two Assumptions of Depletion• in Tropical Developing Countries ••



Forest Area per Person Assuming Zero or No Depletion Up to Year 2025 for Low, Medium and High Population Projections



Forest Area per Person Assuming Current Depletion Rate to Year 2025 for Low, Medium and High Projections

Notes:
- • based on 1985-90 depletion rates
- •• total and average for 62 developing countries in the Tropics

Sources: United Nations, Population Division, 1990 Population Assessments; World Resources Report 1990/91; Gregersen et al. (1990).

accounts for 22 to 51 percent of deforested area (Browder 1988). Among Asian countries, Indonesia has the largest area deforested annually, between 600,000 to 900,000 hectares.

Taking the countries in each region with the highest deforestation rates (that is, Brazil, Indonesia, and Nigeria) and comparing their forest land population growth rates yields a remarkable contrast. As shown in Figure 2, Brazil's rural population is increasing but at a declining rate while Nigeria's population continues to increase at rapid rates. Thus, Brazil's forest area per capita continues to be large, while Nigeria's is progressively declining because of rapid population increases. Meanwhile, Indonesia's rural population is much larger than Brazil's but its projected population in year 2025 will be almost equal that of Nigeria's (Fearnside 1986).

The differences in population growth rates are presented in Figure 3. Nigeria's annual population growth was lower than Brazil's during the postwar years, but increased significantly after 1960. It is projected to decline to about two percent yearly by 2025. On the other hand, Brazil's annual population growth rate has been declining since 1955, down to just 1.6 percent today. While Indonesia's yearly population growth rate has slowed, it has maintained a larger population size relative to Brazil, indicating greater demographic stress on its forest resources,

A similar contrast is provided in the case of the Philippines and India (Figure 4). India's population in 2025 will be over 1.4 billion. The forested area in India in 1990 is about four times larger than the Philippines' but because of population differences, the per capita forest area in the Philippines is three times larger than that of India. The gap widens in year 2025, with per capita forest area in the Philippines higher by 4.5 times that of India's because of continued large increases in India's rural population.

Fuelwood and Population Growth

Developing countries in the tropics rely heavily on fuelwood for energy. Of the 30 countries surveyed by FAO (1981), 19 are dependent on fuelwood for 50 to 95 percent of total energy requirements. Firewood makes up a large proportion of energy consumed in India (32%), Thailand (30%), and the Philippines (40%) . 5 Twenty four countries face fuelwood deficit situations,

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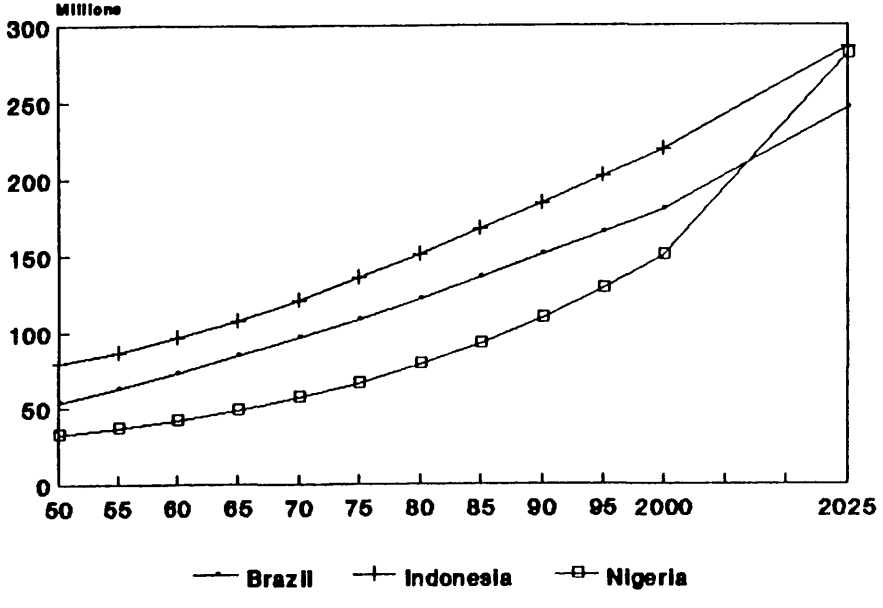
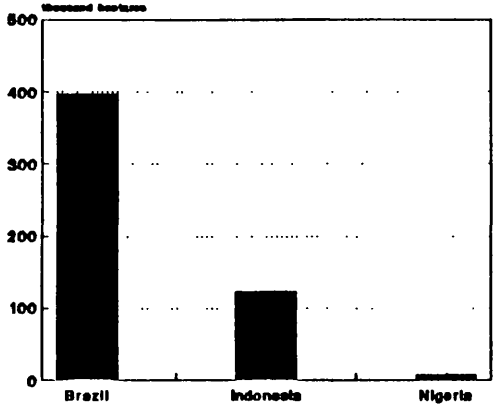
5Countries which are net exporters of fossil fuels have high percentages of households using fuelwood for energy such as Bolivia (42%), Indonesia (34%), Nigeria (54%), and Peru (26%). In Nigeria, 46 million cu m of fuelwood are collected annually but only five million cu m reach urban markets.

FIGURE 2

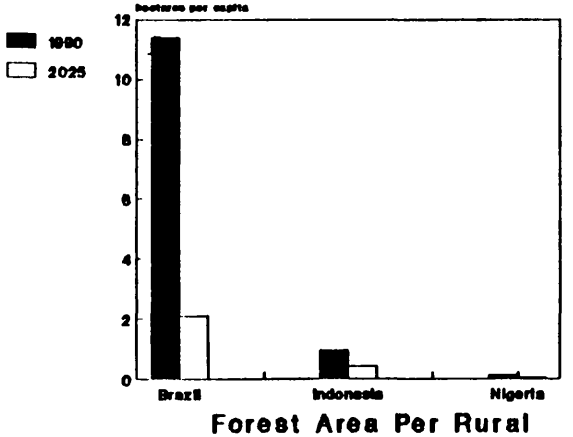
Rural Population, Forest Area, and Per Capita Forest Area in Brazil, Indonesia, and Nigeria 1950-2025/1990



Actual and Projected Rural Population



Total Forest Area (1990)

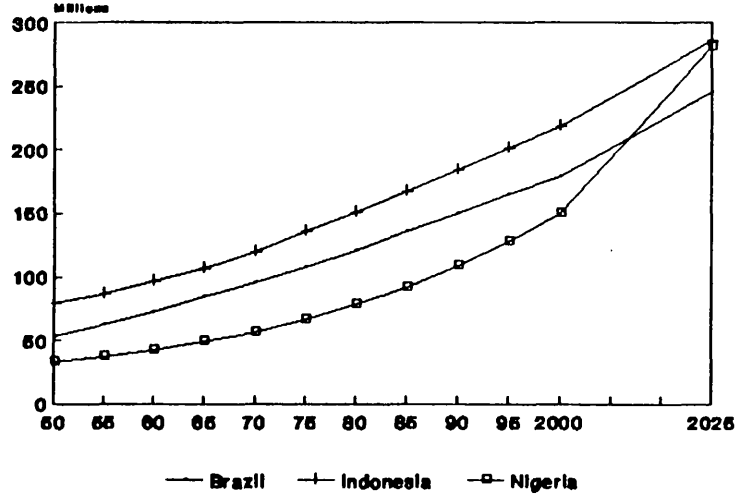


Forest Area Per Rural Person 1990, 2025

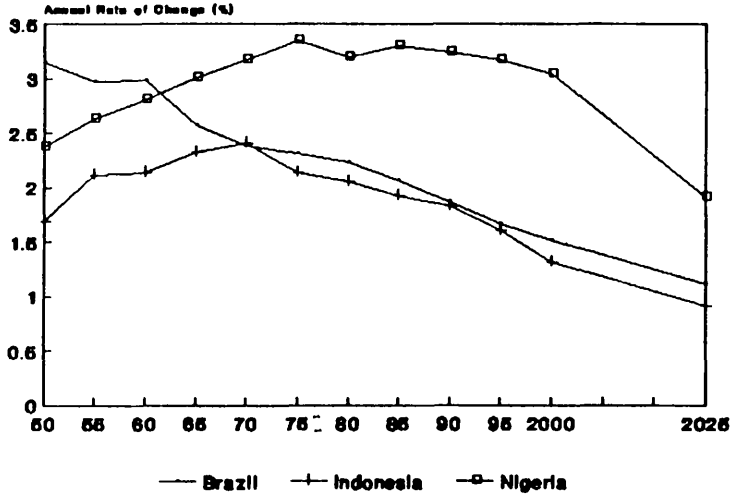
Sources: United Nations, Population Division. 1990 Population Assessments; World Resources Report (1991).

FIGURE *3*

Number and Annual Rate of Change in Rural Population in Three Countries in the Tropics with High Rates of Deforestation: Brazil, Indonesia, and Nigeria 1950-2025



Actual and Projected Population in Rural Areas

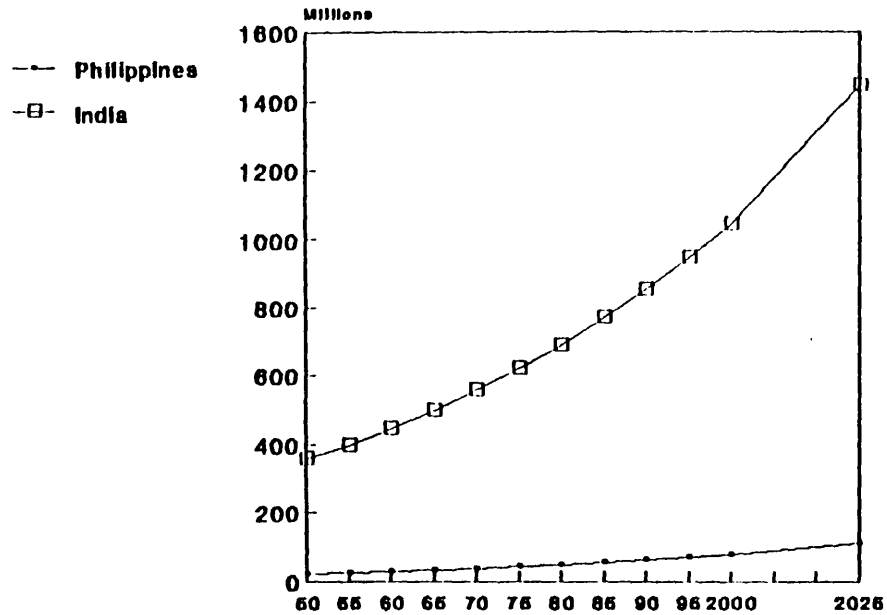


Annual Population Growth Rate (percent) in Rural Areas

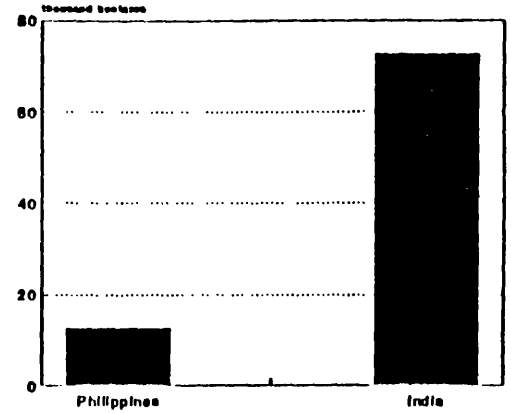
Source: United Nations, Population Division, 1990 Population Assessments.

FIGURE 4

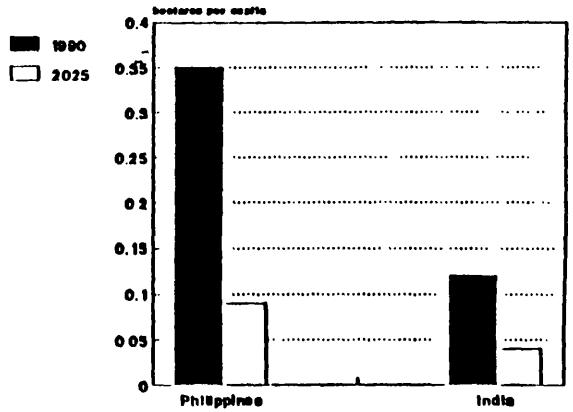
Rural Population, Forest Area, and Per Capita Forest Area in the Philippines and India 1950-2025/1990



Actual and Projected Rural Population



Total Forest Area (1990)



Forest Area Per Rural Person 1990, 2025

Sources: United Nations, Population Division. 1990 Population Assessments; World Resources Report, 1991.

the largest deficits occurring in Gambia, Mauritius, and parts of Indonesia (Gregerson et al. 1989).

During the 80s, over two billion people consumed 1.2 billion cu m of fuelwood at an average consumption of 0.62 cu m per capita per year. This represents almost all of total domestic energy requirements in Sub-Saharan Africa and from 50-65 percent of energy needs in Latin America and the Caribbean. Between 15-86 percent of energy used in Asia comes from fuelwood, at an average of 0.3-1.8 cu m of fuelwood per person (Anderson and Fishwick 1984).

A variation of the FAO estimates of future fuelwood requirements is presented in Table 1. All other factors constant, fuelwood demand rises significantly from 42 to 79 percent in Africa if current population growth rates were allowed to persist. The effect is equally dramatic in Asia, which has a large difference in the sizes of total population between the low and high population projections. Fuelwood demand more than triples, from 36 to 68 percent for all of Asia. It is only in Latin America where population increases are not as rapid regionwide, end fuelwood demand grows by less than 25 percent.

2. Pressures From a Growing Labor Force

A second regional and national trend that interacts closely with population growth is increasing unemployment. During the 90s, the developing countries must generate about 40 million new jobs each year just to absorb into the work force children already born (Leonard 1990). Job creation on this scale poses enormous challenges. Crowded urban centers will have to expand employment opportunities and overtax city services to meet the needs of rapidly growing rural migrants. However, with slow economic growth, job creation has been inadequate leading to high unemployment and underemployment. Consequently, real wages and household incomes decline, eventually motivating alternative movements into marginal forest sites.

Unemployment and underemployment are caused largely by economic stagnation, but it is also a product of an expanding labor force. This growth in working age population, in turn, is a demographic trend that has roots in postwar patterns of rapid population increases, combined with failure to curb such growth during the 60s and 70s.

Changes in age structure in the past 40 years have produced large yearly increments to the labor force in tropical developing countries. During the 50s and 60s, almost half of population growth in the tropics occurred in the age bracket of children under 15 years of age. These eventually moved into the main working age category of 25-59 years, and their numbers began to multiply during the 80s.

Table I
Adjusted Fuelwood Projections Using Three Population Growth Assumptions By Region 1960-2000

Region	Estimated Fuelwood Used in 1980 (million cu m)	Forecast Net Increase in Fuelwood Requirements In Year 2000 Using the following Population Projections of the United Nations: (in percent)		
		Low	Medium	High
Africa	376	42	66	79
Asia	570	36	57	68
L America	285	41	52	65

Notes: 1. Projections computed for 62 tropical developing countries.

2. Forecast net increase in fuelwood requirements based on average consumption of 0.62 cu m of fuelwood per person per year.

3. Population projections based on United Nations, Population Division, 1990 Population Assessments.

4. Fuelwood consumption in 1980 from FAO (1982); cited in Gregerson et al. (1989).

Pressures for job creation will be large for some countries. India alone has to absorb nearly ten million entrants into its work force each year for the next decade (Leonard 1990). Thailand and Indonesia will need 1.2 to 1.5 million new jobs a year, excluding more than 1.1 million who are presently underemployed and looking for additional employment (U.N. 1990). Even if urbanization rates continue to grow faster than population, industrial and service sector jobs will not be able to absorb the rapidly expanding labor force.

Referring to Figure 5, the annual growth in labor force in tropical developing countries exceeded. the increase in employment even before the world's economy collapsed from the oil price crisis in the mid-70s. In 1980-90, the gap between employment and labor force widened considerably. The highest growth in labor force occurred during the early 80s, with rates much higher in Latin America at over 2.5 percent per year. Labor force growth rates are declining in Africa and Asia, but they continue to maintain large absolute numbers of dependent children and elderly in their population.

These two demographic trends — rapid population growth and changing age structure — define one aspect of population's impact on forest resources. When population densities were small, the effects of these factors on forest resources were unimportant. But when population growth was rapid, combined with the pressures of large numbers moving into forested sites, forest degradation intensified.

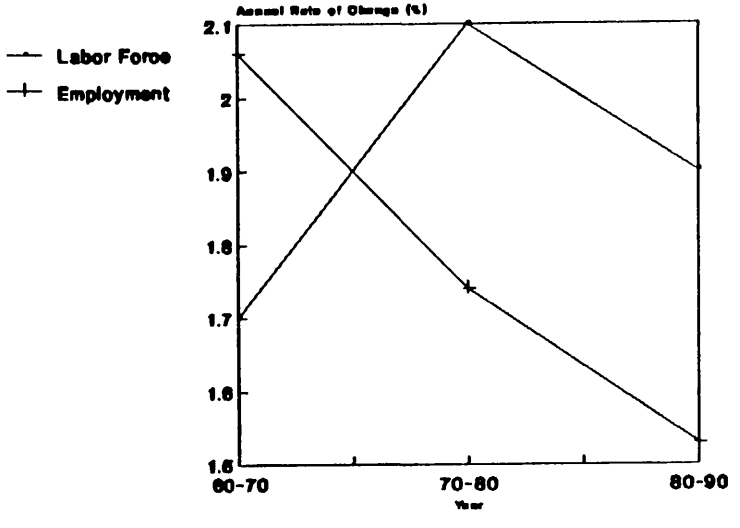
3. Demographic Change Among Key Population Sub-Groups

The third demographic trend that influences the rate of deforestation in the tropics is the increasing size of the "poorest of the poor" — the rural landless, ethnic mountain tribes, and women-headed households. These are sub-groups who: (a) most require family planning and health services and government support; (b) increasingly rely on forest resources to meet subsistence requirements, and (c) have the highest fertility rates and dependency burdens. In 1984, the landless comprised 13 percent of total rural population worldwide or 31 million persons (Sinha 1984). Another 59 percent or 136 million are near-landless with landholdings of less than two hectares (Eckholm 1979; Esman 1978). More than half of rural landless households eventually move to forest areas in search of alternative livelihood.

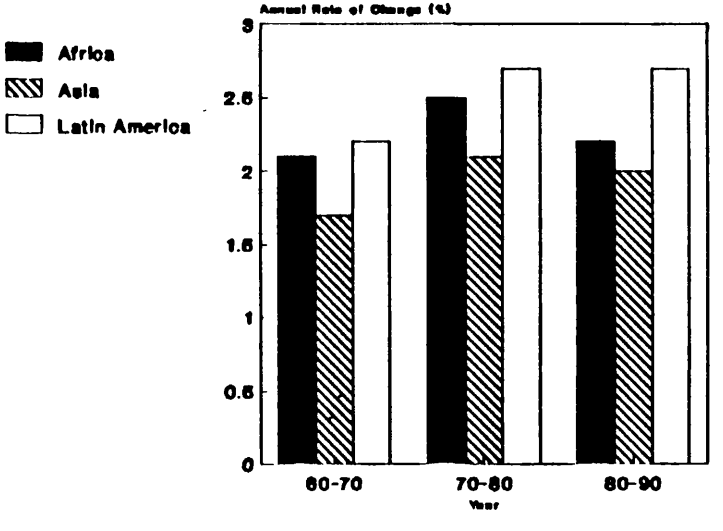
According to the most conservative estimates, there are between 50 to 100 million ethnic minorities residing in classified forest areas (Kichon and Segal 1981). About half of ethnic tribal groups are considered "environmental refugees," having abandoned their homes and farmlands due to natural disasters or deteriorating physical conditions (El-Hinnawi 1985).

FIGURE 5

Annual Growth in Labor Force and Employment in the Developing Tropics* 1960-70/1980-90



Annual Growth in Labor Force and Employment



Annual Growth in Labor Force

• covers 62 countries in the Tropical Forest regions

Sources: International Labour Office, Economically Active Population 1950-2025, vol V, Geneva 1986

More than 40 percent of them are children who are malnourished and out-of-school (UNEP 1990).

The number of poor households headed by women increased rapidly especially in rural Africa, South Asia, and Latin America (Leonard 1990). These households have comparatively smaller numbers of working members and more dependents. They also have less access to credit and other resources. Yet, overall, women laborers account for substantial proportions of total labor in food production and processing.

II. MIGRATION TO FOREST LANDS: THE PHILIPPINE CASE

The fourth demographic trend contributing to resource degradation is increased migration to forest lands. Rural poverty, highly unequal distribution of agricultural land, lack of employment opportunities, and government policies which opened up forest areas are among the major underlying factors motivating movements to forest lands. Because migrants convert forests for agriculture and continuously cultivate these lands, soil fertility declines after only a few years of use. Soil erosion increases without the application of conservation techniques. Thus the migration process is characterized by intensive resource exploitation and poverty both in the sending and receiving areas.

Upland Migration in the Philippines6

The 1990 population of the Philippines is 62.4 million, with an annual growth rate of 2.8 percent between 1980-90. Because of rapid population growth, arable land per person employed in agriculture fell from 1.41 hectares per person in 1960 to 0.13 hectares in 1985. Most of new croplands now come from conversion of forest lands for agriculture. Upland cultivated area increased from nine percent of total cropped area in 1960 to 31 percent in 1985. Of the total potentially arable uplands (or lands with 18 percent slope or higher) almost half are cultivated (see Figure 6).

The Philippine upland population grew at rapid rates. Since the start of the first national population census in 1948, the upland population increased from 5.8 million to over 17.5 million in 1985. The average annual population growth rate of 3.2 percent

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6This section is a summary of the report, Population Pressure. Economic Stagnation. and Deforestation in the Philippines. Washington, D.C.: World Resources Institute, forthcoming.

FIGURE 6
Lowland and Forest Cropped Area in the Philippines 1960-87

(in thousand hectares)

1960 1971 1980 1987

	Area (000 hectares)				Annual Growth Rate (percent)		
	1960	1971	1980	1987	1960-71	1971-80	1980-87
Lowland Cropped	5,581	6,424	7,760	8,845	1.3	2.1	1.9
	(90.6)	(83.4)	(76.8)	(69.3)			
Cropped in Forest	582	1,283	2,349	3,927	7.5	7.0	7.6
	(9.4)	(16.6)	(23.2)	(30.7)			
Total Cropped	6,163	7,707	10,109	12,772	2.1	3.1	3.4
	(100.0)	(100.0)	(100.0)	(100.0)			

Sources: NEDA, Philippine Statistical Yearbook, 1989; RP-German Forest Resources Inventory; World Bank (1989).

between 1950-85 is larger than the national average of 2.8 percent.

Early period upland migration, during the 50s and 60s, was influenced by government settlement programs. Between 1959-63, state-assisted settlers converted 100,000 to 200,000 hectares of forest land each year into upland fields. Government policies on post-logging operations also promoted spontaneous migration in the same way that planned settlements opened up forest sites. The logging trails and roads provided easy access to the area. As a result, more than 62 percent of total upland population in 1985 reside in timber concession areas, covering about half of classified forest lands.

There were numerous non-forestry sector factors that promoted accelerated upland migration. In general these factors inhibited agricultural growth and reduced the absorption of surplus rural labor, leading to greater unemployment and poverty. First, there was the physical limitation of cropland expansion. By the mid-70s, most arable lowlands were already under cultivation. Lowland cropped area in 1975 covered more than 83 percent of arable lands.

Secondly, lowland farms were concentrated in large plantations. These plantations absorbed less labor per hectare than small farms, contributing to greater unemployment and landlessness. Third, most government programs were biased in favor of the urban sector. Subsidies for agriculture were only a small fraction of total credit, most of which were made available to industrial and construction projects.

Lastly, weak and misguided government economic policies aggravated the impact of the debt crisis by inducing labor displacement and creating the conditions which led to a worsening of poverty. During the 80s, the Philippine economy suffered its deepest slump in more than four decades. The period was characterized by volatile price increases, rapid inflation, rising unemployment and underemployment, and widening income disparities. For the first time in 30 years, gross national product (GNP) growth was negative in 1980-85.

A net effect of economic stagnation was the failure to provide new employment in industry. This, in turn, triggered the shift from predominantly urbanward migration, which prevailed during the 70s, to greater movements into open, forest areas in search of arable lands.

As shown in Table 2, upland migration increased rapidly during the period of the economic crisis (1980-85) at a rate of 10.1 percent. By 1985, some 12.2 million or 70 percent of the total population in the uplands were migrants and only 5.3 million belonged to ethnic mountain tribes.

Table 2
Upland Migration and Cropland Expansion into Forested Areas in the Philippines 1950-85

	1950	1960	1970	1975	1980	1985
Total Upland Population (in thousands)	5,868	8,192	11,169	12,702	14,440	17,513
Net Upland Migration Rate[a] (in percent)			3.4	2.2	5.5	10.1
Years Covered			60-70	70-75	75-80	80-85
Upland Migrants as a Percentage of Total Inter-regional Migrants[b]			35.1	31.2	46.5	52.5
Cropland Expansion into Forested Areas[d] (thousand hectares)			582	1,283	2,349	3,927[C]
Annual Rate of Cropland Expansion (in percent)				7.5	7.0	7.6
Years Covered				60-70	70-80	80-85

Notes:

a. Net migration rate is the percentage of net upland migrants to total population in the base year; excludes upland urban areas.

b. Inter-regional migrants include rural-to-urban and rural-to-rural movements.

c. This estimate of cropland in forest was taken in 1987.

d. Cultivated in forest defined as lands used in cropping in slopes of 18 to 30 percent; only 300,000 hectares are farmed in slopes greater than 30 percent.

Basic source of data: Cruz (1991); World Bank (1989).

Property Considerations in Upland Migration

An important breakdown of the upland population is in terms of location. Although all lands in the Philippines above 18 percent slope are classified as part of public domain, some 13 to 35 percent of uplands have been declared alienable or disposable (A&D).7

In 1985 some 11 million people resided in public domain forested sites and were subsequently labelled by government as "squatters." State-sanctioned land claims are provided only through 25-year renewable lease agreements under the government's Integrated Social Forestry program. But this has largely been insufficient, with total number of recipients of lease contracts reaching less than five percent of the population.8

In general, two types of arrangements govern the management of forest lands. One is the formal, organizational structure that administers forest lands within the Department of Environment and Natural Resources (DENR). The DENR has jurisdiction over one-half of total land area in the country. This will be reduced by about 7.5 million hectares of forest lands under the Comprehensive Agrarian Reform Program (CARP).9 The program is expected to benefit 2.7 million upland farmers.

However, the land distribution program in forest lands assumes that government can make the transition from a regulation-oriented approach to one that focuses on institutional changes and extension activities. Budgetary and bureaucratic constraints to accomplish the land distribution program alone will be large, but even more formidable will be the difficulty of changing the official view that farmers should be excluded from forests to a more enlightened view that supports sustainable upland agriculture and community-based management of forests.

7Almost all such lands, however, are occupied by about 6.5 million migrants. Most of these lands are considered upland urban areas.

8The social forestry program was burdened by complex bureaucratic requirements. Its budget was small compared to other forestry programs.

9Since the implementation of CARP in 1987, only the land surveys have been completed. The results of the surveys reduced area labelled as A&D and increased forest land area from 13.85 to 14.96 million hectares or about one-half of total land area in the country (World Bank 1989).

Communal Sharing Among Ethnic Groups

The second type of institutional arrangements for forest resources management operates at the community level. These arrangements are mostly informal. Individual and communal rights and obligations governing forest use are defined by local customs and practices. Many of these rights originate from long-term use of the resource, such as "ancestral and kinship" rights to land, tree, and other resources.

Complex kinship patterns influence definitions of private and communal property among most ethnic tribes in the Philippines. Inherited land, for example, is individually owned and jurally distinct from joint properties acquired after marriage.

An example is found among the Bontok and Northern Kankana-ey villages in northern Luzon.10 Individual lands exist side by side with communally controlled forests and water bodies. The common resources are managed by wards composed of adult males. These wards have control over the use of wet-rice terraces (Prill-Brett 1984).

Another form of communal management of resources is found among the Subanun, a mountain tribe in southern Mindanao. Rather than living in nucleated settlements, Subanuns prefer to construct homes near swiddens. New fields are cleared with a minimum of wild vegetation serving as boundaries between new and previous fields (Frake 1962). The dispersed location of fields and homes supports ad hoc leadership and property control based primarily on religious specialization and egalitarian consensus.

But there is also class differentiation in the allocation of communal resources. Among the Ibaloi, for example, status enhancement is reinforced by the accumulation of wet rice terraces and livestock (Russell 1986). Status is maintained by sponsoring large, prestige-building rituals, which also serves as a means to redistribute wealth and food.

Communal management applies also to the use of labor. Most ethnic groups engage in both individual household labor and large-scale cooperative labor exchanges. Typical communal rules include the sharing of land and labor for feasts (Frake 1962).

Reciprocal labor among the Tagbanwa in Palawan province, for example, is limited to clearing land for swiddens. Women's labor is solicited when the trees mature (Eder 1981). Among the Bontok and Northern Kankana-ey, ward members organize same-sex work

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l0Please refer to Map (Annex) for the location of areas mentioned in this section.

teams. Exchange labor is obligatory in weeding and harvesting (Bacdayan 1977).

Communal management of land and labor is reinforced by the interweaving of ritual and agriculture. Feasts and taboos, and the festive nature of harvests, for example, act as cultural incentives for compliance to community rules and obligations (Russell 1986).

Changes in Property Rights

Tribal populations responded to the rapid migration of lowland farmers in two ways. One was by abandoning existing fields and moving to higher, remote sites. As long as ethnic groups acquiesced to migrant occupation of ancestral lands, amicable relations were maintained. In exchange for exclusive use of the land, migrants offerred "gifts" of fish, canned goods, tobacco, and clothing (Lopez 1987). By and large, it was the threat of violence that intimidated most tribal families into leaving their land.11

The problem of migrant encroachment on ancestral lands stems in part from the government's failure to recognize and transfer ownership of these lands to community-based entities and individuals. The requirements for land registration, surveying, and titling are too lengthy and complicated for most tribesmen. Without a paper title or equivalent document, tribal families lacked the secure tenure critical for dealing with competing claims.

The other response to migrant encroachment was by commercializing upland cultivation. This involved the move towards cash cropping and wage labor. Private property also increases at the expense of communal land rights in most transitional communities. For example, the Tiruray traditionally distinguished swiddens that reverted to communal forest after cultivation. However, with the introduction of plow agriculture, fields no longer reverted to forest and swiddens became private properties (Schlegel 1981).

Among the Mandaya in Mindanao region, small abaca producers regarded their swiddens as communal property. But with rising

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11 Although most migrants knew from experience that it is risky to occupy public domain lands, they continued to settle in these lands knowing that in the future they can register land claims. Initially all forest land is thus considered "open access" or "free-for-all." Migrants gained control of tribal lands by using various means to establish tenure security. These included the adoption of roles as "friends" or "adversaries and creditors."

land values and further incentives to titled land, the Mandaya began to construct fences around their swiddens to protect use rights to the land (Yengoyan 1964).

Lowland migrant encroachment and declining availability of arable forest lands were sufficient incentives to privatize land among the Buhid Mangyans in Palawan province (Lopez-Gonzaga 1987). Some tribes in fact engaged in increased clearance and sale of forest swiddens to migrants.

The hiring of laborers has also replaced exchange and cooperative labor arrangements in many large-sized swiddens. In Benguet province, highland vegetable farmers shifted to using skilled laborers from lowland villages instead of employing poorer relatives for harvesting (Davis 1978).

Land mortgaging to obtain production capital also increased in Benguet province, leading to land consolidation (Russell 1980). Sub-tenancy and lease arrangements evolved in many cash cropping areas. Because permanent field cultivation requires capital and access to information, it benefitted only the better-off farmers (Yengoyan 1964).

Common Property Responses

Although some case studies have shown that replacing a diversified subsistence cropping regime with specialized cash cropping increased farmer indebtedness and vulnerability to price fluctuations, most upland farmers adopted commercial agriculture when they perceived the benefits to outweigh the risks. These risks were often minimized by adopting more equitable systems of allocating use-rights to land and other resources (Scott 1979).

For example, among the Buhid in Mindoro province, inter-household cooperative alliances and traditional practices reinforcing wealth redistribution prevented stratification and class differentiation (Conklin 1961). The Sagada area in northern Luzon is managed largely by ward institutions that govern the allocation of water and other farm inputs. Communal rules of sharing income and wealth prevailed in both Buhid and Sagada areas.

Even among migrant upland communities, elaborate systems of land allocation emerged as a response to increasing population. Later-period migrants, who were predominantly displaced rural workers, could not afford the costs of homesteading and land clearing. They tended to move into densely populated upland sites and initially sold their labor in return for use-rights to previously cleared land.

A study of an upland migrant community in Mount Makiling, Laguna province, showed that new migrants were given an average

of 300 sq m of land plus harvesting rights in return for one to two years of weeding and harvesting labor (Cruz et al. 1986).12 A similar arrangement was observed in Mindoro province. Visayan migrants were provided homelots and woodlots of one-half to one hectare in exchange for one to three years of labor (Russell 1986).

III. POPULATION PRESSURE AND COMMON PROPERTY

As shown in the Philippine case, many of the problems arising from population pressures on forest resources occur within the context of a variety of social and cultural settings. Some of the responses to population stress have worked towards maintaining a balance between population increases and relative scarcity or abundance of food resources. But some case studies in the Philippines also show that these responses can lead to competition and the breakdown of traditional systems of sharing and communal management of resources. Thus, a discussion of local institutions that define a society's responses to demographic and environmental stress provides a perspective for understanding the socioeconomic context where stress occurs and is intensified.

Three propositions that link demographic and environmental pressures to corresponding changes in property arrangements are presented below.

1. State and private property arrangements are not always the best solutions to demographic stress on forest resources.

According to the latest FAO forestry assessment, over 80 percent of forest lands in tropical developing countries are state-owned (Lanly 1982). In more than half of these lands, governments have taken over authority and ownership from long-term indigenous tribal settlers who enforce their own rules and obligations. These rules define who has access to the resource and how such access can be acquired or revoked. But as the Philippine case has shown, tribal land rights remain unrecognized even as their numbers continue to increase (Lynch 1987).

Millions of migrants from lowland and nearby villages

12The hamlets allotted to recent movers come from forest areas that are either "communally managed" or used as "open access areas" (World Bank 1989).

continue to invade forests in search of lands for crop cultivation, fuelwood, and fodder. At the same time, governments encourage such movements by promoting settlement schemes and allowing logging concessionaires to continuously open areas to migrants.

Increasing migration has resulted in inter-ethnic land conflicts. Most of the conflict is over "recognition of usufruct and indigenous rights" established by long-term residency. The Philippines, Thailand, and Malaysia formalize such claims through legal titles. Of course none of the tribal populations know of this requirement and the governments use the failure to file claims as a means for "arbitrary displacement" (Lynch and Talbott 1988).

Another source of conflict is the unequal advantage of the landed elite in land acquisition. Because the system of titling private lands entails the lengthy and complicated procedure of land surveying and registration, privatized forest lands were awarded to more literate and resourceful lowland migrants. In addition, migrants employed "creative" tactics for acquiring ancestral lands, ranging from cash payments and gifts to the use of coercive techniques (Lopez 1987).

There are cases when private property led to losses of traditional sources of food and fuel. For example, in 1970, the government of Kenya privatized land ownership in the forested Mbere area. Consequently, women and landless households no longer had access to fuelwood, fodder, and other tree products and were forced to walk longer distances for these products (Brokensha and Riley 1978).

Private property arrangements have also displaced communal lands in some tribal societies. To avoid occupation of abandoned fallows by migrants, the Bemba of East Africa shifted to permanent field cultivation and sedentary home lots (Fortmann 1984). In one region of Burkina Faso in Africa, local women had limited access to private forests (Bruce and Noronha 1987). Even dead wood could not be harvested. Senegal women collect a year's supply of fuelwood over a period of two months because supplies have become inadequate due to private property restrictions on collecting tree products in nearby forests (Hoskins 1978).

A similar example is found among the Mandaya in the Philippines. Commercial abaca crops were planted in well-defined farm parcels. Farmers constructed fences around fields located near communal forests, thereby restricting access to the upper watersheds of households with terraces in the lower slopes (Yengoyan 1964).

In Africa, the planting of trees by a person other than the land owner is commonly regarded as a "claim" to ownership of the

land (Elias 1963; Ng'andwe 1976). In Kenya during the 70s trees on community-owned land were regarded as "free goods" and were available to community members. Eventually, charcoal production accelerated, and as the population grew, there was greater demand for "tenure individualization and registration" (Brokensha and Castro 1984).

Individual titling of forest lands can lead to increased burning of trees. Among the Manobo in Bukidnon province, Philippines, burned fields commanded a higher price from migrant settlers who preferred semi-cleared swiddens (Allison 1963).

Similarly, in the Andes in Peru, land tenure changes that emerged from the influx of migrants to the mountain region led to smallholder titling in marginal areas and intensive food production in lands previously held as common property. These eventually led to deforestation and soil erosion (Ampuero 1979).

2. There are numerous examples of common property arrangements in forest communities; some have evolved as a response to demographic stress.

The forest is a "common pool resource" in two ways: (a) excluding others from using the resource is difficult and costly, and (b) more than one person can use the resource simultaneously or sequentially (Bromley 1989; Fortmann and Bruce 1988). In general, land tenure in forest areas can be classified as: (a) state owned or controlled, such as the taungya system where people have the right to cultivate forest lands in return for planting trees;13 (b) freehold, where individuals have exclusive use of lands but not private ownership; and (c) communal land, where individuals have usufruct or use-rights to lands that are cultivated or left to fallow, including access to "forested commons" which are open to all who have community use-rights (Bruce 1986).

In many cases, however, a combination of tenurial arrangements is found. In the Sudan, for example, there is widespread access to forest lands but individually owned fields are allowed. When population density increased and less land was available for cultivation, access to forest products expanded to include other members of the community (Bruce and Noronha 1987). Population sub-groups that have social or kin ties to forest land "owners" are permitted to harvest from these lands expanding access to forest resources even among those who are landless.

13This is the dominant form of tenure in most social forestry programs.

Various types of common property arrangements have evolved as a response to increasing population pressures. Elaborate forms of sub-tenurial and access rights are developed to accomodate new population sub-groups. There is also greater age and gender differentiation of labor and individual rights.

In the Ethiopian village of Amhara, wood Mas an open access resource for many years until migrants moved into the area. Consequently some form of control was instituted such as clearly defined access rights. Long-term residents of the village had "first rights" to trees and bamboo on previously cleared land while non-community members had access only to forests in the upper slopes (Hoben 1973).

Religion plays an important role in responding to demographic stress. In Nepal, for example, although holy trees and sacred groves are maintained and "untouched," religious practices encouraged horticultural production of fruit trees and crops in other lands. Since religious teachings regarded fruits and crops as "open access goods" it worked well in absorbing excess population (Bennett 1988).

Expanding use-rights to trees in "communal forests" is an adaptive response to population pressures (Bruce et al. 1985). The most important is the right to harvest produce from trees. A number of sub-tenurial arrangements have evolved in tree harvesting which distinguishes the right to harvest from the right to sell. Among the West African Ibo, the right to harvest tree products is assigned to women (Green 1965).

Another component of land-tree tenure is the right to cut and dispose of trees or parts of trees. These entail the right to forest products in community forests, including the right to sell, lease, mortgage, or pledge trees (Gregerson et al. 1989).

Land and tree rights also coincide with elaborate strategies governing labor exchange and labor absorption that offset population pressures. When the Enga in the New Guinea highlands had population densities of less than 30 persons per sq km, kinship ties were the only basis for allocating land and forest products. As population density increased, rules for labor exchange, land and tree rights, and use-rights to water coming from upper watersheds evolved. These included access to resources defined along kinship lines and gender segregation of labor exchange (Lindenbaum 1972).

Complex tenure and sub-tenure arrangements have worked as well among non-tribal communities, such as the migrant community in Mount Makiling, Philippines (Cruz, et al. 1986). The community grants use-rights to harvest and cut fuelwood from "village forests," but these are legally classified as "state-owned"

forest lands. However, access to trees and lands that have been previously cleared for cultivation is restricted even though "ownership" of these lands remains illegal. Recent migrants are given homelots in exchange for one to three years of free labor, after which time the migrant family can claim a small-sized farm parcel.

3. Diversity is more adaptive to change.

Many forest-based communities practice both short- and long-term adjustments to changes in the environment that may occur from natural causes (such as soil depletion) or external, population pressures. Thus, contrary to common perceptions, forest dwellers are not always conservative, risk averse, or resistant to change.

Several studies have documented how indigenous agricultural systems incorporated new crops and technologies to adjust to physical and economic change. Often population pressures force groups of people to limit cropland expansion and to cultivate existing cleared sites on a permanent basis (Kunstadter et al. 1978). A response to ensuring food supply while maintaining soil fertility is the planting of multi-layered (or polycultural) gardens. This involves the cultivation of two or more crops in close sequence to one another in a single plot.

Multiple or polycultural planting strategies encourage the development of common property institutions (Bruce 1986). Most communally managed forests, because of the diversified food production strategies, adopt well to multiple tenure arrangements. Elaborate "layers" of owners and users govern the use and disposition of multi-storied plants. A family may be assigned to maintain tall trees while another family cares for the fruits and plants that are shaded below the tree. Among the West African Bororo and Fulani, women are assigned the task of distributing fruits, grain and other products that are cultivated below communally managed trees (Hoskins 1978).

IV. SUMMARY AND RECOMMENDATIONS

Migration into forest lands is a demographic process that has a direct impact on forest degradation. But the underlying causes of movement are economic and institutional. These include macroeconomic policies that created conditions of inequality between urban and rural sectors, deepening poverty, land concentration, and landlessness. The worldwide debt crisis of the early 80s aggravated these conditions and promoted greater

unemployment and limited national government options for intensifying agricultural production. The result was accelerated movements into frontier, forested sites.

Common property institutions have in one way accomodated increasing population in forest lands by providing access to forest products. Long-term residency also establishes "claim" to cultivable lands, thus serving as an incentive for relocating the entire household. At the same time, common property rules, including multiple land and tree tenure systems, have served to mitigate the negative impacts of population pressures by expanding access to the resource and encouraging sharing and exchange of labor and forest products.

The cases of local level responses to demographic stress show that sector- and area-specific solutions can be devised to minimize forest degradation. Three propositions are presented. First, state and private property arrangements are not always the best solutions to demographic stress on forest resources. It has been shown that in fact privatization of forest lands led to restricted access to essential forest products such as fuelwood and fodder. In many cases, individual ownership resulted in increased burning and clearing of forest lands and greater adoption of damaging permanent cropping on steep slopes.

Second, numerous examples of common property arrangements in forest communities exist; some have evolved as a response to demographic stress. The examples of common property systems emerged in forest lands that are state-owned. Most of these systems are embedded in local cultures and practices of local groups.

Third, diversified production strategies are more adaptive to change. Common property arrangements have developed alongside use of multiple production strategies. Trees, fruits, and crops are managed using a variety of property arrangements. For example, land is owned separately from the tree, the tree from the fruit and other tree products, plants, and crops (Fortmann 1984).

Recommendations

International development agencies and national governments have supported "social forestry" or "forestry for community development" programs as an alternative to standard reforestation and forest plantation projects in tropical developing countries. The recognition of the role of local-level institutions, property reform, non-government organizations (NGOs), and more recently, women in forestry has grown and continues to receive much attention. The World Bank, for example, more than quadrupled its investments in social forestry programs, from five percent of

total forestry lending in 1967-76 to more than 60 percent during 1977-86 (Gregerson et al. 1989).

But forests continue to be degraded at alarming and rising rates. Migrants invade forested areas, permanently converting forests into farms. As a result of destructive farming practices, soil erosion has increased along with associated on- and off-site environmental problems. In addition, land rights of indigenous, tribal settlers are threatened by aggressive migrant encroachment.

The following recommendations outline a strategy for incorporating population concerns into forestry planning and development and emphasize the importance of using local-level and common property approaches to minimizing demographic stress.

1. Reducing population size may not always lead to less pressures on the resource. Some issues remain unresolved:

   a. The impact of population growth over longer-term forest uses is not known except for a few country case studies. There are important interconnections between population growth and changes in property rights that need to be analyzed through case studies that make use of long-term and in-depth information.

   b. Slowing population growth is a necessary, but not sufficient, condition for halting deforestation. But it is not known which combination of factors will work well to effectively neutralize the effects of demographic stress. There is also a need to evaluate the effectiveness of encouraging common property responses to population pressure.

2. There are few targetted programs that consider the demographic characteristics of population sub-groups that are vulnerable to changes in forest land use and property rights. These sub-groups belong to the bottom 30 percent poor: landless migrants, ethnic tribal groups, and women-headed households. Women are especially affected by restricted access to commonly-held forests, having to walk longer distances to gather fuelwood and other forest products. Population interventions in these sub-groups will have greater impact as they exhibit demographic characteristics that are different from the average.

The following issues need to be examined in designing future social forestry programs.

   a. Planning of social forestry programs is often limited to addressing forestry sector problems.

However, the sources of environmental degradation relate to non-forestry policies such as population programs, land laws, property reform, and macroeconomic policies that influence regional migration patterns.

b. Women are critical links to controlling production and reproduction processes but they are rarely identified as specific target groups for intervention. However, many village-level studies have shown the important roles that women play in defining access to forest resources.

Numerous lessons emerge from the country case studies, the most notable of which is that population pressures are indeed pervasive and that common property institutions can play crucial roles in absorbing excess populations.

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ANNEX

Tropical Developing Countries With Deforestation Rates of 90,000 Hectares Per Year and Above 1980-85

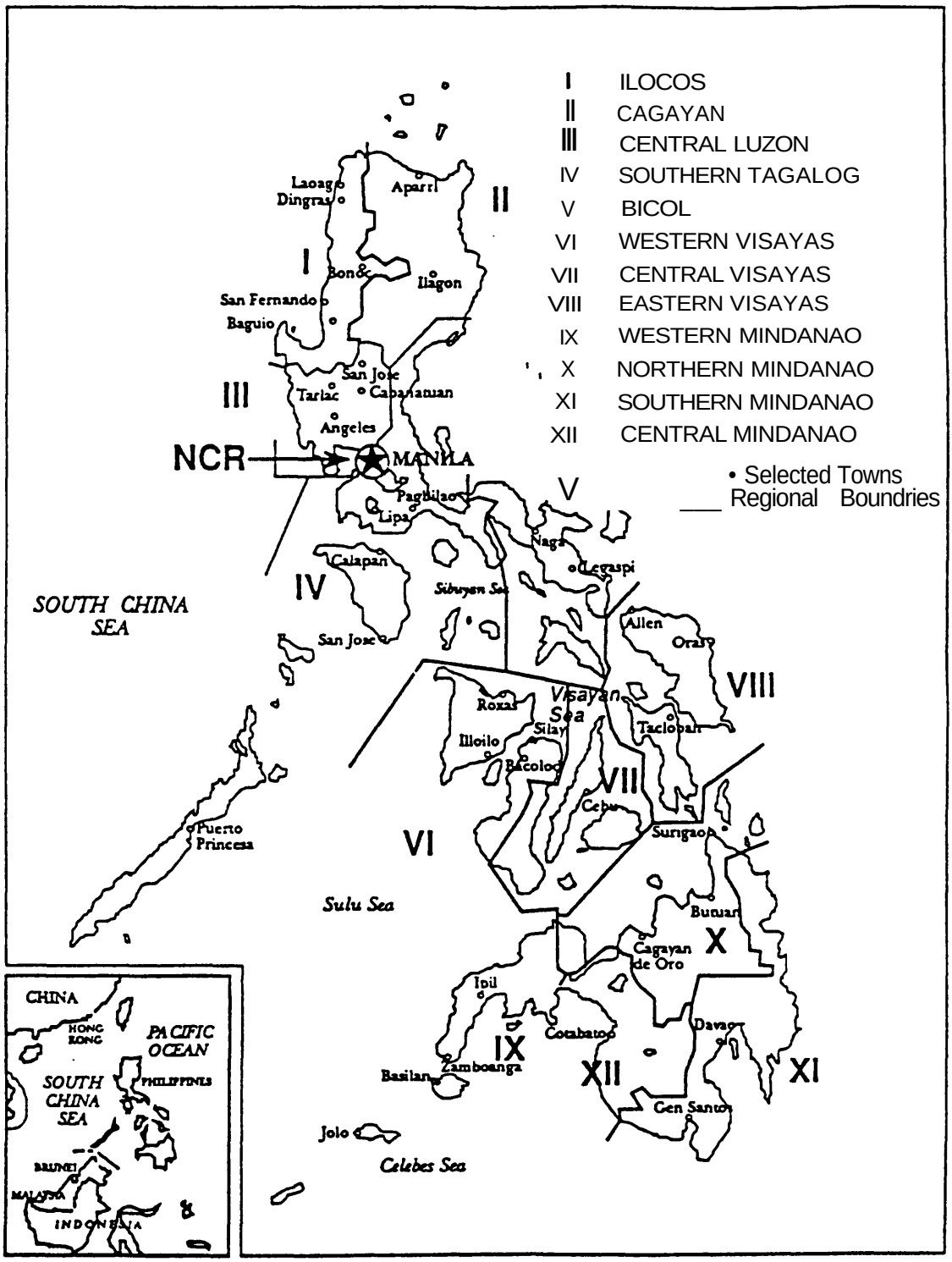
Country (By Ranking)	Annual Deforestation Estimate FAO 1981-85	New Estimates*	Forest Land Area Per Person (Hectares)
1 Brazil	1,480	8,000	11.41
2 Colombia	820	820	5.01
3 Indonesia	600	900	0.96
4 Mexico	595	595	1.97
5 Ecuador	340	340	3.16
6 Nigeria	300	300	0.10
7 Cote d' Ivoire	290	290	0.73
8 Peru	270	270	10.60
9 Malaysia	255	255	2.12
10 Thailand	252	297	0.24
11 Paraguay	190	190	1.82
12 Zaire	182	182	4.87
13 Madagascar	150	150	1.44
14 India	147	1,500	0.12
15 Venezuela	125	125	17.63
16 Nicaragua	121	121	2.89
17 Myanmar	105	677	1.02
18 Lao, People's Dem.	100	100	2.57
19 Philippines	91	143	0.35
20 Guatemala	90	90	0.86
21 Honduras	90	90	1.31
All Countries	6,593	15,717	0.97

* based on most recent land satellite estimates; cited in World Resources Report (1990/91)

Sources: FAO (1984); World Resources Report (1990/91); medium-term population estimates from United Nations, Population Division 1990 Assessments.

ANNEX

Administrative Regions of the Philippines



SOURCE: NSCB *Philippine Statistical Yearbook.* Manila National Statistical Coordination Board, 1989.