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# **Cattle, Broadleaf Forests and the Agricultural Modernization Law of Honduras**

## **The Case of Olancho**

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The authors take full and exclusive responsibility for the views expressed and the data contained in this report.

## Preface

The Center for International Forestry Research (CIFOR), founded in 1993, aims to contribute scientific knowledge towards solutions to threats to forests in developing countries. CIFOR's mandate is to recognise, in all its research efforts, a fundamental link between human economic well-being and the health of forests. CIFOR intends to give special attention to policy issues in carrying out its research.

It is therefore fitting that Honduras should be one of CIFOR's first sites for research. Honduras is one of the most forested countries in Central America, it is experiencing a fairly rapid rate of broadleaf deforestation, and it is one of the poorest countries in Latin America. Moreover, Honduras has recently instituted a wholesale reform of policies governing its agricultural sector (which includes the forestry sector).

In this report, special attention is given to the impact of cattle sector growth on Honduras's primary forests. This research focus is justified because it is clear that large areas of the country's forests - as well as those of Central America as a whole - have been converted to pasture. Nonetheless, we join others (Edelman 1995; Nicholson *et al.* 1995) who have recently voiced caution about placing too much emphasis on the cattle sector in explaining deforestation. Cattle owners are not the only social agents involved in forest conversion and forests are often converted to uses other than pasture. Moreover, the ultimate causes of deforestation reside in the larger social and economic structures of which the cattle sector is a part.

Durable policy solutions to excessive and inappropriate deforestation must be based on an understanding of the complex relations among the cattle and forest sectors, as well as other sectors in the Honduran economy. We acknowledge that ours is only a preliminary and partial step towards such an understanding. The social and economic causes of rapid deforestation in Honduras have barely been researched. There is much yet to be learned and we present only a preliminary list of possible research questions at the conclusion of this report.

There is growing awareness, not just in Honduras but in the world as a whole, that solutions to social and environmental problems are reached through consensus-building between different sectors of society, rather than through the unilateral actions of any one party. In the spirit of that awareness, it is hoped that this report can be of use to policy makers, planners, environmentalists, foresters, cattle ranchers, members of international aid or farmers' organisations - in short, to any and all parties who have a stake in the issue.

# CATTLE, BROADLEAF FORESTS AND THE AGRICULTURAL MODERNIZATION LAW OF HONDURAS: THE CASE OF OLANCHO

William D. Sunderlin and Juan A. Rodríguez

## Summary

*The broadleaf forests of Honduras are among the most extensive in Central America and have been subject to rapid deforestation. Among the important factors in the process of deforestation has been the growth of cattle farming. Structural adjustment policies enacted in 1992 have been directed at overcoming grave economic problems. The authors of the adjustment plans have assumed the same policies will help protect the natural resource base of the country, including its forests.*

*Field research conducted in August - November 1994 sought to understand the effect of the 1992 Agricultural Modernization Law (AML) on the cattle sector and on the management of broadleaf forests in eastern Honduras. The research found that the cattle sector may have benefited from reforms introduced through the new policies (this remains to be proven), while state capabilities in forest conservation and management have clearly declined.*

*The recommendations of this report are to: (1) strengthen the capacity of the state to enforce existing laws aimed at protecting broadleaf forests; (2) revise and amend the provisions of the AML to include provisions aimed specifically at the protection of broadleaf forests; (3) strengthen efforts to harmonise policies among various economic sectors; (4) conduct a national cadastral survey and implement national land-use planning; and (5) strengthen official support and the policy environment for community-based forest management.*

*There are three further research questions in need of attention: (1) Would intensification of the cattle sector assist efforts to reduce deforestation?; (2) Is halting of road construction in the vicinity of forests a promising way of lowering rates of deforestation?; (3) To what extent is broadleaf deforestation alleviated through attention to the cattle sector alone?*

## Introduction

Among countries in Central America, Honduras is one of the most richly-endowed with forests. They cover 50.5 per cent of the land surface of the country (SILVIAGRO 1994: 82) and represent about one-quarter of the forest area in Central America.<sup>1</sup> Broadleaf forests, 50 per cent of the total, are concentrated in the eastern third of Honduras, but there are fragments of stands throughout the country. Pine forests (mainly *Pinus oocarpa*), 49 per cent of the total, are mainly found in the western and central highlands, but there are some dense stands at the eastern tip of the country.

Honduras is undergoing a process of rapid deforestation, having lost 1,428,000 ha (20.1 per cent) of its overall forest cover, 1,225,000 ha (30.1 per cent) of its broadleaf forest cover, and 246,000 ha (82.6 per cent) of its mangroves between 1962 and 1990 (SILVIAGRO 1994: 86). In the same period, through the trade-off between deforestation and regeneration, the area of pine forests has remained approximately the same (SILVIAGRO 1994: 86-87) (Figures 1, 2).

Broadleaf deforestation in Honduras results from the growing demand for farmland and the west-to-east expansion of the agricultural frontier. It is widely

assumed that the growth of cattle herds and subsequent conversion of forest to pasture explain most broadleaf deforestation in Central America (Myers 1981; Ledec 1992: 27; Nations 1992: 192; Parsons 1993: 41). Some observers claim expansion of pasture for cattle is the main cause of broadleaf deforestation in Honduras (COHDEFOR/KFW 1992: 2; Harcourt and Sayer 1995). Other causes of broadleaf deforestation and degradation in Honduras must be taken into account. These include clearing of land for the production of basic grains, coffee and other crops; timber extraction; and the construction of roads.

Structural adjustment policies introduced in recent years in Honduras will have important consequences for economic and environmental trends. In particular, the Law for the Development and Modernization of the Agricultural Sector of 1992 (commonly known as the Agricultural Modernization Law or AML), enacted in association with macro-economic stabilisation and adjustment measures, has introduced comprehensive changes in the agricultural sector and in approaches to the management of natural resources.

Field research conducted in late 1994 in Honduras explored the possible effects of the AML on the process of conversion of forest to pasture in Honduras.

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<sup>1</sup> FAO (1993: Table 3c) estimates that there were 19.6 million hectares of natural forest and forest plantation in Central America and Panama in 1990. Kaimowitz (1995: 7) considers that FAO's estimate of forest cover in Honduras is probably low.



Figure 1. Broadleaf & Pine forests in Honduras, 1965



Figure 2. Broadleaf & Pine forests in Honduras, 1990



The research sought to answer the following questions:

- What have been the general patterns of change over time in the Honduran cattle sector and the status of broadleaf forests?
- What, if any, has been the effect of the AML on the cattle sector, and thereby on broadleaf forests?
- What have been the direct effects of the AML on the conservation and management of broadleaf forests?
- What are other possible effects of the AML on broadleaf forests?

The research sought to answer these questions using: (1) 1993 national census data; (2) secondary literature; (3) a key informant survey of national experts in the livestock and forestry sectors, policy makers and experts at the departmental (Olancho) level; and (4) sociological field research at three sites in the broadleaf forests of the Department of Olancho.

The department of Olancho was chosen as the appropriate site for the case study because it has the largest number of cattle and area of pasture among the 18 departments of Honduras, and some of the largest reserves of broadleaf forests.

The report is structured in three parts. The first presents information on the process of deforestation through pasture expansion, first at the regional and national level, and then at the research sites in Olancho. The second analyses the effect of the AML on the process of forest to pasture conversion and on the management of broadleaf forests in general. The final part presents policy suggestions that emerge from the research findings and identifies several issues for future research.

## PASTURE EXPANSION AND DEFORESTATION

In this section we describe the conversion of forest to pasture as a Central America-wide process, proposing reasons for the phenomenon. This will provide a context for understanding the findings of the research in Olancho.

### Regional Context

Myers (1981: 3) observed 14 years ago that the conversion of forest to pasture was then rather unique to Latin America and especially notable in Central America.<sup>2</sup> Between the mid-1950s and the mid-1970s, the area of pasture in Central America grew from 3.9 to 9.4 million hectares, occupying one-fifth of the total land area of the region (Utting 1993: 19). By the

1980s, two-thirds of all agricultural land in Central America was covered by cattle ranches (Heckadon 1992: 14). Parsons (1993: 41) observes that two-thirds of Central America's forests are now gone, mostly through the process of conversion to pasture.

The "cattle boom" in Central America has been explained largely in terms of the region's economic role in relation to the United States. In his seminal article, "The Hamburger Connection: How Central America's Forests Become North America's Hamburgers", Myers (1981: 4) explains that deforestation resulted from: a 50 per cent growth in the average annual beef consumption in the United States between 1960 and 1976; from the effects of inflation, which promoted a search for low-cost beef; and from Central America's ability to supply low-cost, pasture-fed beef. Other factors include advances in the technology of refrigerated transport, government programmes initiated by the United States (including programmes for road construction to cattle zones and technical assistance and subsidised credit to ranchers) (Williams 1986: 98), and the increasing unaffordability of United States beef on the mass-market because of the effect of rising petroleum prices on the cost of feed grains (Edelman 1985: 170). Between 1960 and 1979, the volume of beef exports from Central America to the United States grew nine-fold and the value of all beef exports from Central America increased from US\$ 8.4 million to US\$ 293.5 million (Williams 1986: 204, 206).

Central American beef exports declined by a factor of two between 1979 and 1984 (Parsons 1993: 46). United States demand fell with declining per capita beef consumption and temporary import suspensions resulting from pesticide contamination (Brockett 1988: 49-50). Central American beef exports were also negatively affected by declining world prices associated with the European Economic Community becoming a net exporter (Kaimowitz 1995: 22) and because of a 1979 law which restricted Central American access to the United States market (Kaimowitz 1995: 23; Edelman 1995: 29).

It now appears that the conversion of forest to pasture may have peaked in the region (Parsons 1993: 46). Kaimowitz (1995: 1) observes a stagnation in the growth of the region's cattle herd, a reversal of forest-to-pasture conversions in traditional areas of cattle production, and a continuation of such conversions at the agricultural frontier.

### National Context

According to national census data, the number of cattle in Honduras grew from 1,146,801 to 2,077,459 (81.2 per cent) between 1952 and 1993 (Table 1). In the same period, the area of pasture in Honduras grew

<sup>2</sup> The conversion of forest to pasture also became a prominent issue in the Amazon Basin. The process appears to have peaked several years ago.



**Table 1:** Cattle population in Honduras, by Department, 1952-1993

DEPARTMENT	1952	1965	1974	1993	1952-1993 % change
Atlántida	27,583	43,235	85,659	147,233	+ 433.8
Colón	23,600	27,623	65,958	125,257	+ 430.8
Comayagua	67,547	75,576	82,393	80,135	+ 18.6
Copán	57,415	77,448	117,249	112,603	+ 96.1
Cortes	86,901	130,330	186,678	160,996	+ 85.3
Choluteca	133,697	158,666	196,891	248,257	+ 85.7
El Paraíso	93,544	99,092	140,383	171,248	+ 83.1
Francisco Morazán	118,407	117,929	132,178	121,351	+ 2.5
Gracias a Dios *	—	7,708	10,199	23,547	—
Intibuca	45,312	43,911	49,460	55,601	+ 22.7
Islas de la Bahía	2,246	2,125	4,333	3,648	+ 62.4
La Paz	36,639	38,940	45,525	35,156	- 4.1
Lempira	73,672	62,931	84,863	71,033	- 3.6
Ocatepeque	34,207	38,170	40,492	35,835	+ 4.8
Olancho	137,895	121,629	195,796	323,856	+ 134.9
Santa Barbara	67,736	105,617	147,489	134,116	+ 98.0
Valle	46,024	51,163	63,271	58,669	+ 27.5
Yoro	94,376	104,462	146,328	168,918	+ 79.0
<b>TOTAL</b>	<b>1,146,801</b>	<b>1,306,555</b>	<b>1,795,145</b>	<b>2,077,459</b>	<b>+ 81.2</b>

**Table 2:** Area of pasture in Honduras, by Department, 1952-1993 (hectares)

DEPARTMENT	1952	1965	1974	1993	1952-1993 % change
Atlántida	22,605	33,963	66,578	81,475	+ 260.4
Colón	11,577	23,318	47,336	84,043	+ 625.9
Comayagua	54,313	65,133	58,262	75,691	+ 39.4
Copán	48,584	93,862	100,422	98,129	+ 101.9
Cortes	83,397	114,942	113,386	93,588	+ 12.2
Choluteca	142,954	139,447	156,363	139,994	- 2.1
El Paraíso	81,714	109,235	132,337	185,424	+ 126.9
Francisco Morazán	86,396	104,419	73,069	77,587	- 10.2
Gracias a Dios *	—	401	3,759	6,740	—
Intibuca	33,929	39,348	34,756	32,850	- 3.2
Islas de la Bahía	4,202	2,702	3,875	2,409	- 42.7
La Paz	26,534	26,125	32,099	26,508	- 0.1
Lempira	33,862	47,720	59,305	51,625	+ 52.5
Ocatepeque	36,709	51,390	52,519	34,569	- 5.8
Olancho	33,561	57,119	127,496	273,720	+ 715.6
Santa Barbara	57,979	133,504	150,816	117,963	+ 103.5
Valle	11,963	21,463	29,655	19,015	+ 58.9
Yoro	52,283	75,070	105,744	131,627	+ 151.8
<b>TOTAL</b>	<b>822,562</b>	<b>1,139,161</b>	<b>1,347,777</b>	<b>1,532,957</b>	<b>+ 86.4</b>

\* In 1952, figures for Gracias a Dios included under Colón

Sources: RDH (1954, 1968, 1978 and 1994)

from 822,562 ha to 1,532,957 ha (86.3 per cent) (Table 2) and increased from one-third to almost one-half of all farmland (Table 3).<sup>3</sup> Between 1965 and 1990, the area of broadleaf forest has been reduced from 4,072,200 ha to 2,847,200 ha (30.1 per cent) (Table 4).

The departments showing the most rapid rates of growth of cattle and pasture (Tables 1 and 2) tend to be located in the districts of Honduras with the highest rates of broadleaf deforestation (Table 4).<sup>4</sup>

**Table 3:** Land use on farm land in Honduras, 1952-1993

LANDUSE	AREA OF FARM LAND							
	1952		1965		1974		1993	
	ha	%	ha	%	ha	%	ha	%
Annual Crops	296,411	(11.8)	344,675	(14.1)	366,344	(13.9)	468,698	(14.0)
Permanent Crops	174,653	(7.0)	191,898	(7.9)	212,011	(8.1)	332,439	(10.0)
Fallow	424,767	(16.9)	226,604	(9.3)	140,291	(5.3)	151,066	(4.5)
Pasture	822,562	(32.8)	1,139,168	(46.7)	1,347,177	(51.2)	1,532,957	(45.9)
Guamil*	-	-	-	-	339,975	(12.9)	440,183	(13.2)
Forest/Woodlands	727,365	(29.0)	463,715	(19.0)	193,071	(7.3)	362,176	(10.9)
Other	61,646	(2.5)	71,635	(2.9)	30,390	(1.2)	49,561	(1.5)
<b>TOTAL</b>	<b>2,507,404</b>	<b>(100.0)</b>	<b>2,437,695</b>	<b>(100.0)</b>	<b>2,629,259</b>	<b>(100.0)</b>	<b>3,337,080</b>	<b>(100.0)</b>

\* "Guamil" is fallow land that has been invaded by forest regrowth. This distinction was not made prior to the 1974 census.

Sources: RDH(1954,1968,1978 and 1994)

**Table 4:** Area of broadleaf forest in Honduras by zone, 1962-1990 (ha)

ZONE	1962	1990	% Change
Atlantic <sup>a</sup>	945,200	258,700	- 72.6
Central <sup>b</sup>	818,600	446,900	- 45.4
Eastern <sup>c</sup>	2,191,400	1,925,400	- 12.1
Western <sup>d</sup>	93,800	168,100	+ 79.2
Southern <sup>e</sup>	23,200	48,100	+ 107.3
<b>TOTAL</b>	<b>4,072,200</b>	<b>2,847,200</b>	<b>- 30.1</b>

Notes:

a = Atlántida, western Colón, Cortes

b = Western 2/3 of Olancho, northern El Paraíso, Yoro, northern Francisco Morazán, Comayagua, Santa Barbara

c = Eastern 1/3 of Olancho, eastern Colón, Gracias a Dios

d = Copán, Ocotepeque, Lempira, Intibuca, La Paz

e = Choluteca, Valle, south of El Paraíso, south of Francisco Morazán

Source: Adapted from SILVIAGRO (1994: 86, Table 2.1 - 7)

<sup>3</sup> Note that the area of pasture has continued to grow in absolute terms over time, but the area of pasture as a proportion of all farmland was higher in 1965 (46.7 per cent) and in 1974 (51.2 per cent) than in 1993 (45.9 per cent) (Table 3).

<sup>4</sup> The loss of broadleaf forest between 1962-1990 is 72.6 per cent in the Atlantic region (where Atlántida, Colón and Cortes are situated) and 45.4 per cent in the Central region (where the western two-thirds of Olancho and Santa Barbara, Yoro, Comayagua, Francisco Morazán, and El Paraíso are situated).

If we juxtapose the growth of the area in pasture between 1965 and 1993 (393,796 ha) and the loss of broadleaf forest cover between 1962 and 1990 (1,225,000 ha), the data appear to show that pasture conversion explains, at most, approximately one-third of the loss of broadleaf forest cover. This is at odds with the assumption held by several observers that pasture conversion explains the majority of deforestation in Central America.<sup>5</sup>

There are two possible explanations for this discrepancy. First, the national census data record the area in pasture at a given moment in time. If we add to the present area in pasture the area of degraded pasture that has gone out of production, this would more accurately reflect the impact of the growth of the cattle sector on forest cover. Second, there is reason to believe the national census data tend to understate the size of the national herd. Latinoconsult (1984: 10-12) observed an underestimation in the size of the cattle herd in the 1974 census. The National Agricultural Surveys of 1988-89 and 1991-92 (RDH 1990, 1993) estimate a much higher size of the national herd than either the 1974 or 1993 censuses.<sup>6</sup> It is possible that some respondents to the national census have been reluctant to be open about the size of their assets.<sup>7</sup>

### ***Factors influencing the conversion of forest to pasture***

There are eleven factors that explain the growth of the Honduran cattle herd, the area of pastures and broadleaf deforestation over the last three decades. These factors are:

- the growth of beef exports;
- the concentration of land ownership by cattle ranchers;
- low labour-absorption and low productivity of cattle-ranching;
- characteristic attributes of cattle as a commodity;
- credit policies in support of cattle ranching;
- the effects of agrarian reform policies;
- the absence of the state in the broadleaf forest;
- capital-labour synergism at the forest margin;
- population pressure;
- the construction of roads and bridges; and
- the culture of cattle ownership.

### ***Beef exports and agro-export orientation***

Honduras has been strongly influenced by the "hamburger connection". National income from beef exports expanded greatly in the 1960s and 1970s. Average annual beef exports rose from 5,000 metric tons in 1961-63 to 21,000 in 1970-72, and 36,000 in 1979-81 (Latinoconsult 1984: 62). The proportion of total Honduran beef production destined for export rose from 16 per cent in 1961 to 51 per cent in 1981 (Brockett 1988: 49). However, between 1981 and 1988, beef exports declined by 50 per cent and production fell 30 per cent (Stonich 1993: 69). Beef dropped from third to seventh place as a foreign exchange earner between 1980 and 1987 (Stonich 1992: 387).

Since 1989, there has been a strong rebound with refrigerated beef export growing from 9,000 to 16,000 metric tons (20 million to 35 million pounds), and from US\$19 million to US\$33 million in value between 1989 and 1992 (BCH 1993: 9). The improved performance was brought about by a modification of exchange rate policies and by the opening of new export markets including Canada, Japan and El Salvador (BCH 1993: 3).

Beef exports, although historically important in the growth of the Honduran livestock sector, presently account for a minor part of overall economic activity.<sup>8</sup> Between 1989 and 1992, domestic consumption averaged 73 per cent and exports averaged 27 per cent of the Honduran beef economy (BCH 1993: 3). Value-added dairy production is important in Honduras, accounting for 15.5 million lempiras<sup>9</sup> of industrial GDP annually in the 1988-1992 period (2.1 per cent of the total), as compared to 9.4 million lempiras annually for beef processing (1.4 per cent of total) (BCH 1993: 2). National milk production grew at an average annual rate of 6.6 per cent over the same period (BCH 1993: 4, 10).

### ***Concentration of land ownership by ranchers***

Land ownership in Honduras is highly skewed. In 1974, landholdings of 100 hectares and larger (3,473 farms or 1.8 per cent of the total) constituted 44.1 per cent of all farmland, while landholdings five hectares and smaller (124,781 farms or 63.9 per cent of the total) comprised only 9.1 per cent of all farmland (RDH 1978) (Figure 3). Of the land in holdings 100 hectares and larger, 65.5 per cent was in cattle pastures

<sup>5</sup> Nicholson *et al.* (1995: 722) appropriately point out that much deforestation in Central America results first from conversion to agriculture and later to pasture. As such, one must be cautious in assigning causality to the cattle sector. This issue is discussed at greater length at the end of the manuscript.

<sup>6</sup> The 1988-89 National Agricultural Survey estimated the national herd at 2,423,520 head of cattle (RDH 1990: 8). The 1991-92 National Agricultural Survey figure was 2,803,440 (RDH 1993: 50). The estimates of the area of pasture in the National Agricultural Surveys, however, are roughly consistent with the area of pasture indicated in the censuses.

<sup>7</sup> In the collection of data for the 1993 National Census in Olancho, some respondents under-reported their cattle and pastures for fear the data would serve as a basis for taxation (personal communication with member of survey team for National Census in Olancho).

<sup>8</sup> Edelman (1995) observes the declining significance of the "hamburger connection" in the Central American region as a whole.

<sup>9</sup> The lempira is the unit of currency of Honduras. In 1994, US\$1.00 was equal to approximately 8.9 lempiras.

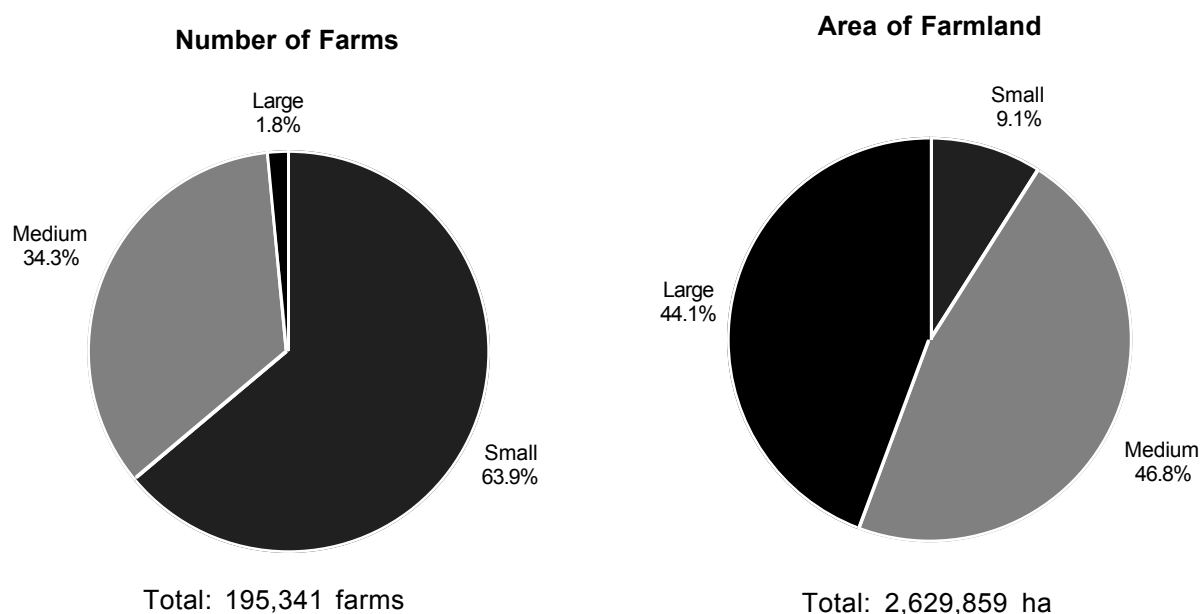


Figure 3. Distribution of Farmland in Honduras, 1974. Source: RDH (1978). Source: RDH (1974)

(RDH 1978). Stonich (1992: 390) observes that acquisition of land for pastures in southern Honduras in the 1960s through the early 1980s increased the concentration of landownership and limited the supply of land for the rural poor. The growing numbers of rural poor from the South migrated to the cities and to the agricultural frontier in the humid tropical forests in northern and north-eastern Honduras (Stonich 1992: 390). Johnston *et al.* (1992: 55, 57) state that, in Central America as a whole, skewed land distribution and insecure land tenure for smallholders have contributed to settlement on fragile lands and to deforestation.<sup>10</sup>

#### ***Low labour-absorption and low productivity of cattle-ranching***

The use of land for pasture is considerably less labour-intensive than use of the same land for other agricultural purposes. Per unit of area, production of cotton is six times more labour-intensive, production of sugar is seven times more labour-intensive, and production of coffee is 13 times more labour-intensive than cattle-ranching (Williams 1986: 117-118).<sup>11</sup> Stonich (1993: 68) says the low labour demands of extensive cattle ranching (6.3 workdays per hectare per year) increased the expulsion of the landless and land-poor from national and private lands. The pastures of large landowners are often under-utilised, contributing to the migration of the landless and land-poor to fragile lands

and forests (Johnston *et al.* 1992: 55, 58-59). In Central America as a whole, the productivity of cattle operations tends to be inversely related to the size of the farm (Morales 1990: 29).

#### ***Distinctive attributes of cattle***

There are several attributes of cattle that enhance their attractiveness as a commodity in comparison to other land-use options, particularly agriculture (Hecht 1993; Loker 1994; Kaimowitz 1995). These include the ability to determine the time of sale for cattle, occupation of a large area of land with little labour, and lower risks in comparison to many crops (Hecht 1993: 166). In addition, there are attributes of cattle that are attractive to small farmers in particular: their use as a supplementary source of household income; availability either for household consumption or to obtain cash; lower labour costs than for crop production; extended use of land where crop production is no longer viable; relative ease of transportation to markets; and their use as a means to protect the value of household assets against inflation (Hecht 1993: 171-172).

#### ***Credit policies in support of cattle ranching***

Over half the loans made to Central America in the 1960s and 1970s by the World Bank and the Inter-American Development Bank supported the production of beef for export (Brockett 1988: 48). From the

<sup>10</sup> Thiesenhusen (1991: 7-8) says that, in Latin America generally, deforestation can be caused by the following three characteristics often found in the "sending area": (1) farming of best lands by the rich in an extensive fashion; (2) micro-plot agriculture by the poor on marginal lands; and (3) a tendency for small farmers to have less secure tenancy than richer farmers.

<sup>11</sup> Ledec (1992: 43) points out an additional cost of the low-density settlements associated with cattle farming. In these areas, it is far more costly - on a per capita basis - to provide development infrastructure such as roads, schools, and health centres.

early 1960s until the early 1980s, Honduras received half of all World Bank loans disbursed in Central America; of this amount, one-third was for livestock projects (Jarvis 1986: 124). Between 1970 and 1994, the Central Bank of Honduras supplied domestic credit in the amount of 2,145,000,000 Lempiras to livestock (18.3 per cent of the total) and 132,000,000 Lempiras to silviculture (1.1 per cent of the total) (SRN 1994: 126). Credit support to the cattle sector has been noted as a contributing factor to deforestation in Central America as a whole (Johnston et al. 1992: 50) and in Honduras (COHDEFOR/KFW 1992: 37). In recent years, international credit for cattle ranching has declined sharply. Edelman (1995: 39) says domestic subventions to the cattle sector in Central America have declined in connection with the imposition of neo-liberal development models and high indebtedness.

### *Effects of agrarian reform*

Honduras's agrarian reform programmes, which began in 1962, incorporated factors which both stimulated and alleviated the conversion of forests to pasture. First, the Agrarian Reform Law<sup>12</sup> required that 90 per cent of landholdings be dedicated to agricultural use, implying that if the forest cover of a plot of land exceeded 10 per cent, it could be subject to expropriation. Many farmers converted forests to pasture specifically in order to avoid legal expropriation. Second, certain large cattle ranchers migrated eastward and toward forested areas because their land had been expropriated.<sup>13</sup> Third, the overall failure of the agrarian reform programme to achieve its goal was damaging to broadleaf forests. Because of the inability of government officials to redistribute lands in the south-west in the early 1970s, many rural people migrated to the forested north-east (Walker et al. 1993: 41).<sup>14</sup> Humphries (1994: 20) observes that the failure of agrarian reform co-operatives in western Honduras induced migration of former members to her field research sites in the broadleaf forests of Atlántida.

One possible positive effect of the programme on forest management was the requirement that cattle

ranchers maintain a minimum number of cattle per unit area of land. It is unknown to what extent this provision induced intensification of cattle ranching, and to what extent this may have alleviated pressure on forest management. A second possible positive effect is that, to the degree people did receive lands in successful agrarian reform settlements, they probably did not migrate.<sup>15</sup>

### *Absence of the state*

More than 90 per cent of broadleaf forests in Honduras are property of the state. According to national laws, these forests may not be colonised for agricultural use or other forms of private exploitation, and may not be deforested.<sup>16</sup> None the less, tens of thousands of hectares of broadleaf forest have been deforested by migrant ranchers and producers of agricultural crops, and there is an active market in government land. The government is virtually powerless to stop this process, because of the low number of field personnel it can deploy in remote areas to enforce the law. Dedicated personnel often cannot impose their will for fear of retaliation in remote areas and less ethical personnel can be bribed to "look the other way". Broadleaf forests are attractive targets for pasture expansion, not only because the soils beneath them are thought to be better than those beneath pine forests, but also because most of the remaining stands are on state lands and are therefore susceptible to settlement (Walker et al. 1993: 6). These stands tend to be far from population centres and are thus also far from the reach of the state.

### *Capital-labour synergism at the forest margin*

There are two broad categories of colonists at the forest margin: middle- to large-scale cattle ranchers seeking to expand their area of pasture and their herd; and poor campesinos who have no or very few cattle, seeking subsistence incomes. In many areas of the broadleaf forest, there is a synergistic relationship between the two groups that facilitates the process of land clearance and pasture creation. Small farmers at the leading edge of the frontier deforest a plot of land and use it to produce agricultural crops for one or two years. They then convert the plot to pasture and sell it

<sup>12</sup> Muñoz (1993: 51-52) says the Agrarian Reform Law, although enacted in 1962, did not lead to significant reform efforts until 1972. In spite of greater official efforts to distribute land, the post-1972 agrarian reform programme has fallen short of expectations. "It is generally agreed that the Honduran land reform over the last two decades has been disappointing at best in terms of either distributing land to the rural poor, formalizing and increasing tenure security, or modernizing the agricultural sector" (Muñoz 1993: 52).

<sup>13</sup> Personal communication with Emil Falck, Advisor to the Director, National Agrarian Institute, October 1994.

<sup>14</sup> Walker et al. (1993: 41-42) note that the migration of campesinos from the south-west to the Aguan Valley created additional problems for forest management. Through the creation of agrarian reform co-operatives in the valley, cattle ranchers were pushed from the valley to the hillsides. The prevailing philosophy at the time was that bottom-lands are suitable for agriculture and uplands for livestock.

<sup>15</sup> We credit David Kaimowitz with this observation.

<sup>16</sup> The Nueva Palestina resettlement programme, established in the broadleaf forest of south-eastern Olancho in 1972, pre-dates the creation of COHDEFOR and the enactment of national laws aimed at protecting remaining broadleaf forests.



to a cattle owner. The small farmer then moves further into the forest to clear more land, hoping to sell it to a rancher two years later. In some cases, cattle ranchers supply power saws to small producers to facilitate the process of deforestation (COHDEFOR/KFW 1992: 37; SILVIAGRO 1994: 114).<sup>17</sup>

### **Population pressure**

The human population of Honduras has grown from 1,884,765 in 1961 to 4,248,561 in 1988, thus more than doubling in the space of 27 years (Rodríguez de Simons 1990: 11). This is one key factor in the country's increasing scarcity of land and in the search for additional land at the forest margin.

### **Road and bridge construction**

The construction of roads and bridges has advanced the growth of the cattle sector in Central America. Williams (1986: 91) observes that, in the period of the beef export boom, the area of paved roads nearly quintupled. Roads and bridges linked pastures to packing houses and facilitated the transport of freshly slaughtered beef in refrigerated containers to ports (Williams 1986: 87, 91). Roads created in the broadleaf forest for the extraction of timber have assisted colonisation by small producers and the subsequent conversion of large areas of forest to pasture (Nations 1992: 193-194; Kaimowitz 1995: 1, 35).

### **Culture of cattle ownership**

In Honduras, as in other countries of Central and South America, ownership of cattle is a status symbol, signifying power or - at the very least - a minimum level of financial solvency. This is an important cultural factor motivating ownership and accumulation of stock.

## **Case study findings in Olancho**

As noted earlier, Olancho is the department in Honduras with the most livestock and pasture (see Tables 1, 2). Between 1952 and 1993, its share of the national pasture area grew from 4.1 per cent to 17.9 per cent. One of the factors contributing to the rapid expansion of cattle ranching in Olancho in the 1960s and 1970s was its relatively large area of forests - that is, land seen as usable

for expansion of the agricultural frontier. In 1974, the Department of Choluteca, historically one of the strongholds of cattle ranching, had only 11 per cent of its area in forest cover, compared to 49 per cent of the area of Olancho (Williams 1986: 127-128).

Protected areas have been demarcated in eastern Olancho and adjoining departments in an effort to conserve the remaining broadleaf forest cover in eastern Honduras. In 1980, the Río Plátano Biosphere Reserve was established in an area that encompasses north-eastern Olancho, eastern Colón and western Gracias a Dios. In 1992, the Tawahka Anthropological Reserve and Patuca National Park were established in eastern and south-eastern Olancho. These three sites, now jointly called the Paplawans Protected Area, aim to conserve the corridor of broadleaf forest that stretches from Honduras's northern coast on the Caribbean Ocean to the Nicaraguan border.<sup>18</sup> The area is also meant to protect the Pech, Misquito and Tawahka-Sumu indigenous communities that reside in the forest.<sup>19</sup>

In spite of these efforts, the agricultural frontier has been pushing eastward with little resistance. It is estimated that 20-25 per cent of the Río Plátano Biosphere Reserve has been seriously degraded and deforested since its establishment and colonists have penetrated 35 km into the "strict protection" nuclear zone of the reserve (COHDEFOR/KFW 1992: 1, 12). There are now an estimated 37,000-47,000 settlers living in 135 villages in the Paplawans Protected Area.<sup>20</sup>

The three sites in the study are located on state land within the boundaries of the Paplawans area (Figure 4). Two of the sites (Sites A and B) are spontaneous settlements. The third site (Site C) was established through a government programme of the early 1970s to resettle people from Choluteca to the Río Patuca area in south-eastern Olancho.<sup>21</sup>

All 201 households at the three sites were documented in a household census. Of the total, 70 households (34.8 per cent) own at least one head of cattle and 131 (65.2 per cent) do not. There is a significant variation in the proportion of cattle owners to non-cattle owners between the three sites (Table 5). Sixty-four (91 per cent) of the cattle-owning households and 63 (48 per cent) of the non-cattle owning households were interviewed through a survey (see Field Research Methodology, Appendix 1).

<sup>17</sup> For additional information on the social dynamics of the process of deforestation in Honduras, see COHDEFOR/KFW (1992: 36-37), Herlihy and Leake (1992: 4-5) and SILVIAGRO (1994: 114-115). For discussion at the regional level of Central America, see Nations (1992: 193-194) and Pasos (1994: 45).

<sup>18</sup> Paplawans encompasses more than one million hectares of land. Sources differ widely on the area of the Biosphere Reserve. SILVIAGRO (1994: 291) gives 840,500 ha, whereas COHDEFOR/KFW (1992: 12) claims the area to be 525,100 ha (comprising 318,200 ha nuclear zone and 206,900 ha buffer zone). Data are not available on the area of the Tawahka Reserve and Patuca National Park.

<sup>19</sup> The approximate sizes of the indigenous populations are Pech (1,575), Tawahkas (975) and Misquito (35,000); most of the Misquito Indians live east of the Paplawans area in Gracias a Dios (SILVIAGRO 1994: 56-58).

<sup>20</sup> This estimate is derived from two sources. COHDEFOR/KFW (1992: 22-23) estimates there are 20,000-30,000 people living in 70 towns in the Río Plátano Biosphere Reserve. The data in Herlihy and Leake (1992: 7-16) can be used to calculate approximately 17,000 people in 65 towns in the Tawahka Reserve and Patuca National Park.

<sup>21</sup> For background on the Nueva Palestina resettlement project in the Río Patuca area, see Velasquez Nazar (1980).



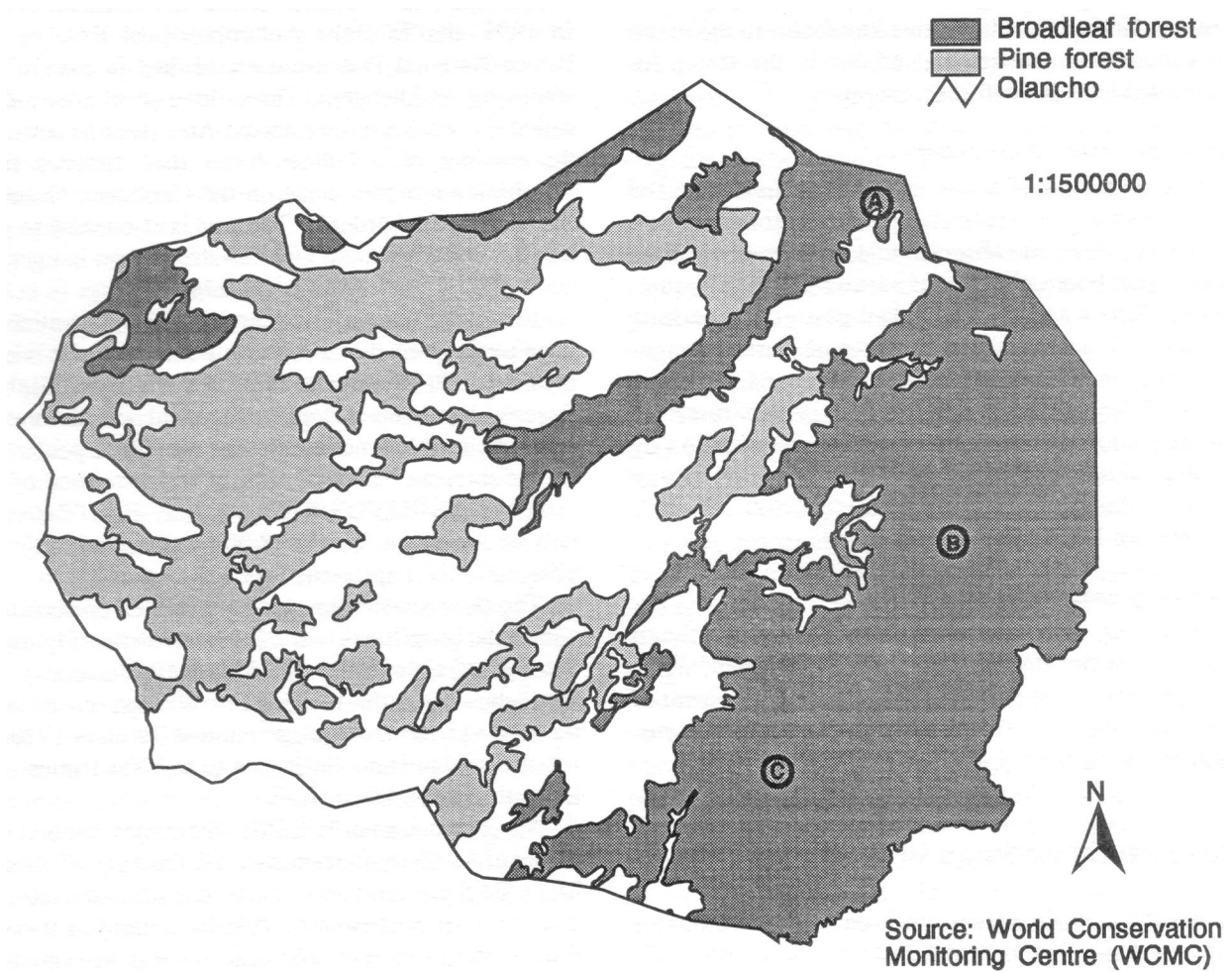


Figure 4. Three field sites in the Department of Olancho, Honduras

**Table 5:** Heads of household by type - cattle owner or non-cattle owner

TYPE OF HOUSEHOLD	HEADS OF HOUSEHOLD							
	SITE A		SITE B		SITE C		TOTAL	
	no.	%	no.	%	no.	%	no.	%
Cattle	16	(23.5)	33	(53.2)	21	(29.6)	70	(34.8)
Non-cattle	52	(76.5)	29	(46.8)	50	(70.4)	131	(65.2)
<b>TOTAL</b>	<b>68</b>	<b>(100)</b>	<b>62</b>	<b>(100)</b>	<b>71</b>	<b>(100)</b>	<b>201</b>	<b>(100)</b>

Source: 1994 CIFOR Field Research

**Table 6:** Heads of household by location of birth

DEPARTMENT OF BIRTH	HEADS OF HOUSEHOLD			
	SITE A	SITE B	SITE C	TOTAL
Olancho	43	25	0	68
Choluteca	0	2	66	68
La Paz	0	14	0	14
Valle	3	6	0	9
El Paraíso	1	3	5	9
Yoro	3	3	0	6
Francisco Morazán	0	6	0	6
Other	18	3	0	21
<b>TOTAL</b>	<b>68</b>	<b>62</b>	<b>71</b>	<b>201</b>

Source: 1994 CIFOR Field Research

The first colonists at the three sites arrived in 1950 (Site A), 1975 (Site B) and 1970 (Site C). One hundred of the 201 heads of household in the census, or roughly one-half, came to the villages after 1983. The heads of household are almost all migrants who were born outside the present villages. At an aggregate level, the Departments of Olancho and Choluteca are the most frequent places of birth of the informants (Table 6).

### Major Findings

- The ratio of pasture to agricultural land is almost three to one, on average, at the three sites together (Table 7).

The ratio is slightly less than three to one at Site A, almost four to one at Site B and almost one to one at Site C. (Many households at Site C are members of cattle co-operatives; data on cattle co-operative land-holdings are not included in Table 7, so the data under-

state the amount of pasture land at Site C.) Pasture accounts for 37 per cent, on average, of the total area of household landholdings across the three sites.

- Although at the aggregate level owners of cattle are a minority (Table 5), they own the majority of the land (Table 8).

At Site A, cattle owners are a minority and own most of the land. At Site B, cattle owners are a slight majority and own three-quarters of the land. At Site C, cattle owners are a minority and own slightly less than half the land.

It should be noted, however, that only part of the land of cattle owners is used for pasture. At the time of the research, 2,396 ha (46.7 per cent) of the total 5,132 ha held by cattle owners was under pasture,<sup>22</sup> 500 ha (9.7 per cent) were for agriculture, 550 ha (10.7 per cent) were in fallow and 1,686 ha (32.9 per cent) were woodlands.

<sup>22</sup> Some non-cattle farmers own pasture. This explains the higher figure for the area under pasture (2,717 ha) in Table 7.

**Table 7** : Land holdings by land-use type at three research site

LAND USE	LAND HOLDINGS (area and percentage)							
	SITE A (n=68)		SITE B (n=62)		SITE C (n=71)		TOTAL (n=201)	
	ha	%	ha	%	ha	%	ha	%
Pasture	653	(34.6)	1,748	(37.4)	316	(40.3)	2,717	(37.0)
Agriculture	226	(11.9)	476	(10.2)	271	(34.6)	973	(13.2)
Fallow	620	(32.8)	362	(7.8)	83	(10.6)	1,065	(14.5)
Woodlands	391	(20.7)	2,085	(44.6)	114	(14.5)	2,590	(35.3)
<b>TOTAL</b>	<b>1,890</b>	<b>(100.0)</b>	<b>4,671</b>	<b>(100.0)</b>	<b>784</b>	<b>(100.0)</b>	<b>7,345</b>	<b>(100.0)</b>

Source: 1994 CIFOR Field Research

**Table 8**: Total land owned by type of household - cattle owner or non-cattle owner

TYPE OF HOUSEHOLD	AREA OF LAND OWNED							
	SITE A (n=68)		SITE B (n=62)		SITE C (n=71)		TOTAL (n=201)	
	ha	%	ha	%	ha	%	ha	%
Cattle Owner	1,210	(64.0)	3,536	(75.7)	386	(49.2)	5,132	(69.9)
Non-Cattle Owner	680	(36.0)	1,135	(24.3)	398	(50.8)	2,213	(30.1)
<b>TOTAL</b>	<b>1,890</b>	<b>(100.0)</b>	<b>4,671</b>	<b>(100.0)</b>	<b>784</b>	<b>(100.0)</b>	<b>7,345</b>	<b>(100.0)</b>

Source: 1994 CIFOR Field Research

- The largest cattle owners control a disproportionate share of land.

Cattle owners with 50 or more head of cattle, numbering ten (5 per cent) of the 201 heads of household, own 829 head of cattle (60.7 per cent of the total) and have 2,303 ha of land (31.4 per cent of the total).

The other 60 cattle-owning households in the survey each have an average of 8.9 cattle per household and 47 ha of land. This corresponds to the national pattern observed by Latinoconsult (1984: 12-13) a decade ago showing that the majority of cattle owners in Honduras are small and medium producers.

- For most households with cattle, the primary source of income is basic grains production rather than livestock.

For 44 of 64 (68.7 per cent) of the cattle owners in the survey, the primary income source in the year prior to the interview was production of basic grains. For only eight (12.5 per cent) of the cattle-owning respondents was livestock the main source of income (Table 9).

Latinoconsult (1984: 13) observed a decade ago that most owners of cattle in Honduras are in the subsistence economy, focusing on the provision of food for their families and owning cattle as a form of savings.<sup>23</sup>

<sup>23</sup> Nicholson *et al.* (1995: 729) note that many cattle farmers in Central America combine cattle and crop production as a way to minimise economic risks.

**Table 9:** Primary source of income for cattle-owning households in year prior to the interview

PRIMARY SOURCE OF INCOME	CATTLE-OWNING HOUSEHOLDS				
	SITE A	SITE B	SITE C	TOTAL	(%)
Basic Grains	9	20	15	44	(68.7)
Cattle farming	3	2	3	8	(12.5)
Commerce/trading	-	3	2	5	(7.8)
Wood Products	2	1	-	3	(4.7)
Non-Basic Grains Agriculture	-	2	-	2	(3.1)
Transport of Timber	1	-	-	1	(1.6)
Other	-	-	1	1	(1.6)
<b>TOTAL</b>	<b>15</b>	<b>28</b>	<b>21</b>	<b>64</b>	<b>(100.0)</b>

Source: 1994 CIFOR Field Research

**Table 10:** Cattle stocking rates at three research sites in Olancho

SITE	NO. OF CASES	HEAD OF CATTLE	ANIMAL UNITS*	HECTARES OF PASTURE	ANIMAL UNITS PER HECTARE
A	15	509	448	588.00	0.76
B	28	535	458	834.40	0.55
C	21	299	230	224.70	1.02
<b>TOTAL</b>	<b>64</b>	<b>1,343</b>	<b>1,136</b>	<b>1,647.10</b>	<b>0.69</b>

\*Animal units are here defined as the number of head of cattle older than one year, plus 0.5 times the head of cattle less than one year.

Source: 1994 CIFOR Field Research

- The ratio of cattle to pasture land (stocking rate) at the three sites is below the national average of 0.82 animal units per ha.<sup>24</sup>

The rates are: 0.76 animal units per hectare at Site A, 0.55 per hectare at Site B and 1.02 per hectare at Site C, for an aggregate average of 0.69 animal units per hectare at the three sites (Table 10).

- Most of the survey respondents view their standards of living as improving.

All survey respondents (both cattle owners and non-cattle owners) were asked to compare their present standards of living with that in their previous village. Ninety-three (87.7 per cent) of the 106 valid

respondents said their present standard of living was "better", nine (8.5 per cent) said it was "the same", and only four (3.8 per cent) said it was "worse". (Twenty-one of the 127 respondents were excluded from the analysis because they had always lived in the case-study villages.)

- Most cattle owners view the cattle economy as improving.

When asked to compare the situation of cattle farming now with five years before, 31 of the 47 heads of cattle owning households (66.0 per cent) said "better", 15 (31.9 per cent) said "the same" and one (2.1 per cent) said "worse". (Seventeen of the cattle-owning respondents had no cattle five years before.)

<sup>24</sup> The national stocking rate was calculated by disaggregating the total number of cattle (2,077,459) in 1993 into animals older and younger than one year. The older animals were counted as one animal unit and the younger ones counted as one-half. The result (1,253,078 animal units) was divided by the area of pasture (1,532,957 ha) to obtain the figure of 0.82 animal units per ha.

- The number of cattle at the three sites will increase.

Cattle owners were asked if they plan to acquire more cattle. Fifty-seven of the 64 cattle-owning respondents (89.1 per cent) answered "yes". Non-cattle owners were asked if they plan to acquire cattle in the future: 40 of the 63 (63.5 per cent) replied "yes".

- Cattle are acquired through family savings rather than credit.

The 40 non-cattle owners planning to acquire cattle were asked how they plan to finance the acquisition. Thirty-two (80.0 per cent) plan to acquire cattle through family savings (that is, mostly through the production of basic grains), six (15.0 per cent) plan to borrow from family or friends, and only one (2.5 per cent) plans to use bank credit. Among the 64 cattle-owning respondents, only one had obtained bank credit for cattle in the year prior to the interview. Banks often require a land title as collateral for a loan and only two of the 201 households at the three sites has full title to their land.

- Virtually all of the respondents had no knowledge of the AML.

All survey respondents were asked if they could explain the aim of the Agrarian Modernization Law. One hundred and twenty two (96.1 per cent) of the 127 respondents said they knew nothing about the AML.

In summary, the field research at the three sites found that pasture covers almost three times the area of agricultural land. Cattle owners, although numbering only one-third of the area residents, own two-thirds of the land. Their pastures occupy almost one-third of all occupied land, even though livestock serves as a primary source of income for only eight (4.0 per cent) of the 201 households in the census.

The ownership of cattle is heavily skewed. A small number of cattle ranchers own the majority of cattle and a substantial portion of all land. The majority of households owning cattle are part of the subsistence economy.

It is likely that more land will be cleared for pasture, as cattle owners generally plan to increase cattle numbers and non-cattle owners plan to acquire stock. Purchase will be financed largely through savings from basic grains rather than credit.

Almost none of the respondents had heard about the AML. The lack of implementation or knowledge of the AML in the case study communities raises doubts about the effectiveness of addressing the problem of broadleaf deforestation by means of this policy reform.

## EFFECTS OF THE AGRARIAN MODERNIZATION LAW

In this section, we present research findings on the effects of the AML on the management of broadleaf forests. The data were obtained principally through interviews with 50 key informants (see Field Research Methodology, Appendix 1). Three general lines of influence of the AML on the broadleaf forest are discussed: the effect of the AML on the cattle sector and thereby on broadleaf forest management; the direct effect of the AML on the capacity of the state to manage the broadleaf forests; and various possible indirect effects. Before examining the results, it is necessary to specify the aspects of the AML that are relevant to the study and the intended environmental aims of the legislation.

### Background

The AML, implemented in April 1992, is the key instrument through which the Honduran government intends to realise the goals of structural adjustment in the agricultural sector. One of its central goals has been to stimulate and revitalise the sector through privatisation, through the liberalisation of prices and markets and through various legal mechanisms that aim to improve the structure of incentives for rural producers. Another central goal has been to stimulate the rural economy through agro-industrial development and the export of agricultural products.

The clauses of the AML relating to this study are:

- It is now possible to acquire title to national and common lands up to a maximum area of 200 hectares, provided the parcel has been worked a minimum of three years and provided that it has not been deforested for that purpose (RDH 1992: 25; Title V, Article 15).
- The pre-conditions for the expropriation of land have been reduced. Those that remain authorise expropriation if (1) the ceilings stated in Article 25 of the Law of Agrarian Reform have been exceeded; and (2) the parcel has not been cultivated or has been idle for more than 18 consecutive months (RDH 1992: 26; Title V, Article 51).
- It is now possible to obtain title to parcels of land of between one and five hectares in size, whereas previously parcels had to be five hectares or larger (Moreno 1994: 31).
- Private lands may be rented provided the costs of acquisition have been fully paid by the owner (RDH 1992: 27; Title V, Article 54).



- The Honduran Corporation for Forest Development (COHDEFOR) has been transformed from a business enterprise into the national body responsible for forest management. COHDEFOR has the responsibility for controlling private forest exploitation through the implementation of forest management plans and for managing and protecting national forests (RDH 1992: 35-36; Title VI, Articles 73-76).
- People who have forests on their private landholdings have the right to exploit and market their forest resources without prior authorisation of the state (RDH 1992: 35; Title VI, Article 72). (Previously, people were required to obtain authorisation.)

The environmental aims of the AML are explicit. One of the nine objectives of the AML is to "Orient the expansion of agricultural activities toward modalities of exploitation that are compatible with the conservation and good management of natural resources, the protection of the environment and the ecological equilibrium of the country" (RDH 1992: 6; Title I, Article 4, Part h). One of the underlying suppositions of the AML is that the depressed agricultural economy and rural poverty are at the root of environmental deterioration; it is assumed that the structural adjustment programme will improve the relative position of the rural sector in the national economy, therefore reducing environmental problems (Walker *et al.* 1993: 3).<sup>25</sup>

People associated with the formulation of the AML believe that an improved land market and economic growth will be among the main ways in which rural poverty and environmental problems are alleviated. Johnston *et al.* (1992: 57)<sup>26</sup> explain that insecure land tenancy is one of the factors that leads to deforestation. The creation of a land market, it is argued, provides incentives for legitimate land owners to "conserve resources because their ability to recoup the short-run cost of conservation is improved", and by giving land owners the "ability to exclude others and control the resources on (their) land" (Johnston *et al.* 1992: 59).

Roger Norton<sup>27</sup> explains that one of the fundamental aims of the structural adjustment programme is to "alleviate poverty and initiate a new process of economic growth"; one of the most important steps toward this goal is to "establish clear, stable and uniform rules of the game among sectors and industries" (FFE 1990: 7).

## Effects of AML on the Cattle Sector

In the survey of key informants at the national level, eight of the leading experts on the cattle sector were asked "What has been the effect of the AML on the cattle sector in Honduras?" All answered that the net effect has been to improve the economic condition of the sector. It was explained that the AML has increased tenure security for large cattle ranchers by rescinding some of the pre-conditions for appropriation of lands. With improved tenure security, large cattle ranchers have increased their investment. Reportedly there are many cattle ranchers who are buying lands from small producers at a cheap price. The respondents mentioned other effects of the AML which have stimulated the cattle sector, among them the influence of market liberalisation, greater access to the international market and the possibility of converting forests to pasture through the privatisation of forest resources.

Although the respondents have stated that the AML has helped the cattle sector, it cannot be concluded with certainty that this has happened. The respondents had no empirical data to support their conclusions. Moreover, it cannot be concluded that the AML is the only factor that has influenced recent changes in the Honduran cattle sector. The sector has been growing since long before the implementation of the AML (see for example Tables 1 and 2). It is noteworthy that the national producer price of beef in Honduras rose 32 per cent in 1990 and 29 per cent in 1991 (BCH 1993: 9). This probably resulted from a drastic devaluation of the Honduran currency in 1989.<sup>28</sup> It is difficult to distinguish factors that influence the cattle sector independently of, and prior to, the AML and those that influence the sector through the AML. Nevertheless the observations of experts can be viewed as a preliminary indication of the possible stimulus effect of the AML on the cattle sector.

If the AML has in fact stimulated the cattle sector, it is fitting to ask "What has been the effect of this growth on the broadleaf forests?" In view of the historical link between the growth of the cattle sector and broadleaf deforestation, it is reasonable to suppose that this pattern may have continued. It is important to point out, however, that the reported improvement of tenure security for large cattle owners is occurring outside of the broadleaf forest. Most cattle owners in the broadleaf forest do not have, and may not get, private title to their land. None the less,

<sup>25</sup> Walker *et al.* (1993: 2) note that the explicit environmental aims of the AML result from the time of its formulation (in 1990, during the preparations for the Rio Summit) and because of new environmental mandates in the sectoral loans of the World Bank and the Inter-American Development Bank.

<sup>26</sup> Johnston *et al.* (1992) worked with Abt Associates, a US-based consultancy firm involved in the formulation of the AML.

<sup>27</sup> Roger Norton is sometimes referred to as the 'father' of the AML.

<sup>28</sup> Richards (1993: 22) notes that the currency devaluation made agriculture more profitable, thus increasing pressures on forests.



increased tenure security for large cattle ranchers and improved economic conditions in the cattle sector may be contributing indirectly to deforestation. Recall that cattle ranching absorbs little labour and therefore has contributed to out-migration in certain areas of livestock growth. It is possible that, as a consequence of recent economic improvements for large ranchers, some small producers may have sold their land or may no longer have wage work, and have migrated to the agricultural frontier.

## Direct Effects of AML on Forest Management

Through interviews with key informants at the national level and through informal observation in Olancho, we found that the AML has had a clearly negative direct effect on broadleaf forest management.

Leading national experts on Honduran forestry<sup>29</sup> were asked "What has been the effect of the AML on the management of broadleaf forests?". More than half the respondents said the effect was "bad" and none said the effect was "good". The remainder of the answers were roughly evenly divided among: "effect unclear or unknown", "mixed effect", "no effect" and "answer unclear/no answer".

From the explanations accompanying their replies, we can suggest the following reasons for a perceived net negative effect. On one hand, at the legal level, the AML has made a positive step by transforming COHDEFOR into a state entity responsible only for forest management. It has done so by removing the forest exploitation role that undermined COHDEFOR's management mandate, and by instituting the requirement that people submit a Management Plan for exploitation of parcels that exceed 50 ha on private land.<sup>30</sup>

These potentially positive changes, however, have been overwhelmed by the budget and staff cutbacks mandated through the structural adjustment programme and AML.<sup>31</sup> COHDEFOR now has an appropriate mandate in relation to broadleaf forest management, but not the means with which to adequately implement that mandate. It is assumed by many of the key informants that the rate of deforestation has increased as a direct consequence of the state's reduced presence and its lack of means to implement Management Plans.

These responses were corroborated by conversations with members of COHDEFOR's conservation and management field personnel in Olancho. They appeared to be demoralised by inadequate institutional support to carry out their duties. Their low morale has been compounded by reports of corruption in other divisions of COHDEFOR and within the Armed Forces, another state institution responsible for forest protection.

We asked the forestry experts "COHDEFOR has been converted from an institution responsible for forest exploitation to one responsible for forest management. Can it be expected that forest management will improve as a result of this change?" To this question, the responses were roughly evenly divided among "yes", "no" and "it's not yet clear/it could go either way". The common thread among these answers is that the future depends largely on the willingness and ability of the government to commit more funds to allow COHDEFOR to fulfil its mandate.

Although overall the AML has created the legal framework through which COHDEFOR could assume the role of state protector and manager of the broadleaf forests, there are certain clauses in the AML that undermine the legal basis for sound management. The most serious weaknesses are clauses which reveal a bias towards concern for pine forests and neglect for the broadleaf forests. For example, the only clause which mentions the goal of preventing deforestation states:

With the aim of preventing deforestation, the State will promote the establishment of power stations and will improve the efficiency of firewood use in homes and industries. Likewise, the State will establish the mechanisms necessary to reconvert industries that are now using firewood as their source of energy (RDH 1992: 36; Title VI, Article 79).

It is clear this clause is meant to apply only to pine areas, since power stations would likely be located near centres of population, far from broadleaf forests, and since the problem of excessive fuelwood gathering pertains to pine areas. It is ironic that rates of deforestation are high in broadleaf areas, whereas the overall area of pine forests - as mentioned earlier - is more stable. If the problem of deforestation is to be

<sup>29</sup> Among these were nine employees of COHDEFOR (seven working at the national level and two working in Olancho), 11 independent experts on Honduran forestry, two representatives of the private timber sector, and two representatives of NGOs working on Honduras forest issues.

<sup>30</sup> Management plans are also required on parcels smaller than 50 ha, but at a less-detailed level.

<sup>31</sup> In April 1993, a document titled "New Organizational Structure for the AFE-COHDEFOR and Financial Requirements for the Fulfilment of Goals in 1993" stated that "... all these policy changes (introduced through the AML) have generated conjunctural problems that require timely decisions. The forestry sub-sector is presently facing serious problems, among which are the following: (a) the budget of COHDEFOR has been affected by a considerable decrease in its current income; (b) there is a need for profound changes in organisational structure in order to comply with the new mandates indicated in Decree 31/92; (c) there is a reduction in the capacity to protect forests, accompanied by the desertion of technically qualified staff" (COHDEFOR 1993: 1).

confronted through Honduras's legal framework, it is necessary to amend the AML with clauses that refer specifically to the situation in the broadleaf forests.

## Possible Indirect Effects

We have so far discussed two possible paths of influence of the AML on the broadleaf forests: the effect of the AML on the cattle industry and in turn on forest management, and the direct effects of the AML on forest management. There are of course other areas of influence. Among them are those intended by the architects of the AML: the presumed positive effect of increased private incentives and land tenure security; and the presumed positive effect of overall economic growth in Honduras.

### *Private Incentives and Tenure Security*

In principle, enhancement of private incentives and land tenure security for those presently living in the broadleaf forests are sound ways of improving management of the resource. The Project for the Development of Broadleaf Forests (PDBL), implemented by the Canadian International Development Agency since 1988, has sought to encourage sustainable management of broadleaf resources by giving groups of forest dwellers protected access rights to timber. The project has faced significant problems, which include inappropriate land and tree tenure policies (Richards 1993: 22) and inadequate government support (Szaraz 1991: ii; Richards 1993: 22). In a study comparing participatory natural forest management in Honduras, Mexico and Peru, Richards (1993: 22) observes that:

The (Honduran) government, by assuming control of forests and land without the capacity to do so effectively, has increased the rate of resource depletion. It is clearly a pre-condition for successful community based natural forest management that the resource users have ownership or at least control of the resource, as in the other cases.

Another planned forest conservation project in Honduras also focuses on the issue of private incentives and tenure security. A joint project of COHDEFOR and the German Government is planning to improve management of the Río Plátano Biosphere Reserve in part by

instituting a system of limited usufruct rights to land for forest dwellers (COHDEFOR/KFW 1992: 59, 81-82). With respect to the issue of land tenancy in broadleaf forests, a PDBL document states:

There is no doubt that to control the destruction and irrational exploitation of national forests it is necessary to put into practice measures that ensure clear property rights, but with appropriate restrictions on usufruct rights for forest use (PDBL 1992: 14).<sup>32</sup>

In some ways, the AML has been helpful in promoting local incentives for forest protection. Hernández-Mora (1994, Chap. IV: 10, 18, 41; Chap. VII: 30) notes that the AML has given a legal basis for the security of the social forestry projects of the PDBL, and that legal land use restrictions resulting from the AML have led to more successful enforcement of forestry laws by COHDEFOR.

On the whole, however, the AML is counter productive on the issue of private incentives and land tenure security for broadleaf forest protection. The principal problem is that it has no clauses that are specifically directed at this issue and to the unique circumstances of broadleaf forests. The broad assumptions of the AML on the environmentally beneficial effects of private incentives, land tenure security and the development of land markets are out of step with the conditions that exist in broadleaf forests. Four points are made in this regard.

First, the AML appropriately forbids acquisition of title to lands in state forest, but unfortunately it makes no provisions for forms of tenure that fall short of full ownership, such as limited usufruct rights. It is noteworthy that at the three research sites in Olancho, almost all respondents had no legal title (whether full or usufructuary rights), yet almost all want to acquire legal title.<sup>33</sup> It is worth examining whether forest dwellers would be interested in acquiring protected usufruct rights if they were to agree to forego raising cattle, or agree to other conditions which enhance possibilities for forest protection.

Second, as mentioned earlier, the AML assumes that the creation of a land market is an important step toward the resolution of environmental problems. In the broadleaf forests, there is an active private market in land in spite of the fact that this activity is illegal.<sup>34</sup> The land market in the forest, however, is not contributing to conservation and management of the

<sup>32</sup> SILVIAGRO (1995: 25) observes "A new modality of national forest land tenure is being initiated through usufruct contracts, which were introduced through the Law of Forest Incentives".

<sup>33</sup> In Honduras the two categories of formal land ownership are *dominio pleno* (plenary domain) and *dominio útil* (usufructuary rights). "Plenary domain" means legal and complete private ownership title, whereas "usufructuary rights" refer to use rights on land legally owned by another entity, often the state. Of the 127 survey respondents, two had plots with full ownership title (*dominio pleno*), and none had plots with a usufruct title (*dominio útil*). One-hundred and twenty-four of the 127 answered "yes" when asked if they thought it was important for them to obtain an ownership title.

<sup>34</sup> Muñoz (1993: 73) points out that "Untitled lands are valuable and get traded regularly, even in countries where the majority of small farmers are untitled, such as Honduras (a land-scarce country) and Paraguay (a country with very high rural labour mobility)".

forests. The problem is not an absence or lack of land markets, but rather that the market activity in question (trade of forest land with potential agricultural use) is premised on deforestation.

Third, there are some indications that the land titling provisions of the AML may be working against the goal of broadleaf forest management. In certain areas of the forest where the provisions of the AML are known, residents have sought to acquire full ownership titles.<sup>35</sup> Richards (1994: 8) believes the AML has promoted land settlement in the buffer zone of the Río Plátano Biosphere Reserve. Hernández-Mora (1994; Chap. IV: 38-45) records that at one site in the Department of Colón, wealthier members of the forest community obtained full title to lands through the provisions of the AML; in doing so, they undermined the tenure security of the members of a social forestry project who had overlapping claims to the same land.

Fourth, as mentioned earlier, the AML presumes that tenure security in areas of out-migration might deter migration to the agricultural frontier. We asked several experts on land tenure to comment on this possibility. Generally speaking, it does not appear that increased land tenure for poor farmers, in and of itself, is sufficient to deter migration to ecologically sensitive areas. There are several reasons. It is, above all, inadequate resources (insufficient land, poor quality soil, erosion, no funds for inputs, etc.) that drives people off the land, not insecure tenure. It is precisely on the most marginal lands where people are likely to have the least interest in acquiring title to the land. If the land resources are poor, then only substantial inputs can restore the fertility of the land and the poor, by definition, cannot afford this. For the poor, acquisition of title to land is most difficult. As Walker *et al.* (1993: 29) suggest, the otherwise nominal cost of acquiring title to land can add up for those of limited means.

It is conceivable that increased tenure security for marginal farmers, in combination with increased income-earning opportunities and access to income-generating resources, can help deter decisions to migrate. But in these cases, it cannot be assumed that increased tenure security is the key precondition for a positive outcome.

### **Overall economic growth**

One of the underlying assumptions of the Honduran structural adjustment programmes and of the AML is that overall economic growth, presumably stimulated by these measures, will help alleviate pressure on nat-

ural resources. At face value, this is a reasonable assumption. It is possible to imagine, for example, that higher rates of economic growth, associated with higher-paying and more stable employment and greater absorptive capacity of the urban and industrial job market, might alleviate pressure on broadleaf forests.

There are two problems, however, in assuming that structural adjustment and the AML can have the desired effect in this regard. First, after three years of the programme, there is little evidence of economic growth on a scale or of a quality that would substantially reduce pressure on broadleaf forests.<sup>36</sup> Backers of structural adjustment point out correctly that there is almost always a "lag effect" between the implementation of structural adjustment programmes and the possibility of restored economic growth. If this is true in Honduras, then the country may have to wait several more years before the adjustment programme and AML can produce a macro-economic climate that is conducive to improved management of broadleaf forests.

Second, if it is true that the ameliorative economic effects of the AML are years off, then these effects may have little meaning in relation to the problem of lost and degraded forest cover. At the present rate of deforestation and degradation of the broadleaf areas, there will be nothing left but isolated fragments within a decade, unless action is implemented to change the situation.

## **CONCLUSIONS AND RECOMMENDATIONS**

In this paper we have focused on the role of the cattle sector in the rapid deforestation of broadleaf areas. We believe special attention is justified to the role of the cattle sector in this process for two reasons. First, it is clear that pasture conversion accounts for a large share of broadleaf deforestation, even though there are not sufficient data to demonstrate it accounts for most such deforestation. Second, it is doubtful that the low benefits from the cattle economy justify the massive appropriation of land and the sacrifice of forest resources entailed. At the national level, pastures are 46 per cent of agricultural land (see Table 3), yet the livestock sector represented 24.2 per cent of the gross added value of the agricultural sector in 1993<sup>37</sup> and beef represented only 4 per cent of all export income in 1992 (Moreno 1994: 13).

<sup>35</sup> Although it is formally illegal to acquire title to state forest land, the lack of a formal forest inventory allows some people to claim that the land to which they seek title is agricultural.

<sup>36</sup> Moreno (1994: 72) points out that in the two years after the implementation of the AML, poverty rates and inequality of income have increased; he adds it is not clear this is an effect of the structural adjustment programme, but it is clear the programme has not yet changed the overall economic situation for the better. Walker *et al.* (1993: 27) explain that in the year after the implementation of the AML, the terms of exchange have not improved for farmers; instead the largest economic boost has gone to the development of the industrial park sector. In 1994, the rate of economic growth in Honduras was negative (- 1.5 per cent).

<sup>37</sup> Preliminary data from the Central Bank of Honduras, July 1994.

We found tentative evidence at our research sites in Olancho that the income benefits from cattle farming are heavily skewed, and that cattle tends to be a secondary income source for the majority of owners. While pastures accounted for one-third of cleared land, livestock grazing was the primary income for only 4 per cent of the survey respondents. We also found that the ratio of cattle to land in the broadleaf forests appears to be far lower than the national average. In spite of these tendencies, the trajectory is toward increased land clearance at the sites for cattle.

We examined the effect of the AML on this process and found that its application appears to have aggravated the problem. The AML aims to increase agro-industry and agro-export income while improving incentives and capabilities for protecting natural resources. At this point in time, it appears to be accomplishing the former goal, but not the latter. The AML may have stimulated the livestock industry and it has clearly weakened the state's capability to protect national forests. At the theoretical level, there are various indirect effects of the AML that could alleviate the problem - among them increased privatisation, more secure land tenure and increased economic growth. Here again, however, there is little evidence that we can expect the desired effects, or that they can be achieved soon enough.

## Recommendations

We add our voices to the observers who state that a lasting solution to Honduras's forest problem requires - first and foremost - alleviation of rural poverty and of sharply polarised incomes and land ownership (Johnston *et al.* 1992: 55-59; Stonich 1992: 385, 395; Stonich 1993: 13; Moreno 1994: 68-69; Utting 1994: 235, 241). We also recommend the following concrete steps toward improved management of broadleaf forests:

- *Strengthen state forest management capability*

State forest management institutions must be given sufficient resources to evaluate and monitor the management plans mandated through the AML, and to enforce compliance with forestry laws. We agree with observers who remark that the adjustment and privatisation process has led to excessive restrictions on the functions of Honduras's forest management institutions (Szaraz 1991: 36; Moreno 1994: 46-47, 68). We urge attention to a study on privatisation and forestry which concludes: "... privatisation will seldom, on its own, provide the best solutions to forest management problems, but that a mixture of public and private action is usually required ... (T)here must be comprehensive forest protection legislation in place prior to privatisation" (Hurditch 1992: abstract, 52). This perspective is echoed by Castilleja (1993:

29) who remarks that "Perhaps the greatest challenge to sustainable forest management is that it requires greater oversight by forestry authority at a time when public policies are promoting economic growth through deregulation and reduced involvement of the state in commercial activities".

- *Revise and amend the AML*

We agree with the recommendation of Szaraz (1991: ii) that there needs to be a policy that specifically concerns broadleaf forests. It would seem that the AML is the appropriate legal framework within which to frame such a policy. It was remarked earlier that the AML is strikingly deficient in attention to this issue. This may be because, as Moreno (1994: 28) observes, there was no consensus-building process associated with the section on forestry aspects (Title VI) of the AML. We urge that the section on forestry aspects of the AML be revised through a consensus-building process in order to assure the greatest possible level of participation and compliance of people in forest communities. As mentioned earlier, we believe the AML should address itself to the issue of limited usufruct rights in broadleaf forests. We encourage exploration of the idea of offering forest residents limited usufruct rights in exchange for withdrawal from cattle production.

- *Strengthen the process of inter-sectoral planning*

We encourage the Unit for the Planning of the Agricultural Sector (UPSA) to increase its attention to issues that concern broadleaf forests. In particular, we suggest that it commission further research on the influence of various sectors (including the cattle sector) on forest management as a basis for improved inter-sectoral planning.

- *Cadastral survey and land-use planning*

Honduras has no formal documentation on the precise boundaries of state-owned forests. With a lack of such documentation, it is exceedingly difficult to protect broadleaf forests against encroachment and to plan future uses of those lands. The Honduran government is giving attention to the issue of the national cadastral survey in fulfilment of action plans in the framework of structural adjustment policies. To date, however, there has not been much progress. We suggest that cadastral surveys in the area of the agricultural frontier (Olancho, Colón, Gracias a Dios) be prioritised in view of the pressing need to improve management practices at the forest boundary.<sup>38</sup>

- *Support community-based forest management*

In view of the pressing constraints on state financial resources, COHDEFOR would do well to increase its support to social forestry and community-based forestry management. To the extent that COHDEFOR can assist

<sup>38</sup> SILVIAGRO (1995: 45) urges priority be given to resumption of the national cadastral survey in "those departments that have the greatest abundance of forests, such as Olancho, Gracias a Dios and Colón".



devolution of management systems to the municipal and community level, it lightens its own financial and management burdens. In particular, it seems an opportune time to research the challenges faced by the PDBL in order to identify robust social forestry models.

## Future Research

The field research was carried out over the space of three months. Far from being an exhaustive survey of the issues addressed, it should be considered a preliminary inquiry and diagnostic survey. In the course of the research and afterwards, several questions were raised which require further investigation.

### *Would intensification of cattle ranching help or harm broadleaf forest management?*

The scientific literature is divided on whether cattle intensification is helpful in alleviating broadleaf deforestation. Some argue that land-saving technology in livestock farming is a promising tool (Murgueitio 1990; Serrao and Toledo 1990; Parsons 1993: 47; Simpson and Conrad 1993: 1747; Humphries 1994: 5; Loker 1994; Nicholson *et al.* 1995: 728). Others argue that cattle intensification is not helpful. Hecht (1993: 176) explains small cattle farmers do not respond to incentives for intensification because their reasons for practising extensive cattle husbandry go beyond the economics of production. Ledec (1992: 34) claims even a doubling of stocking rates would not sufficiently diminish cattle-ranching's environmentally destructive and labour-expelling qualities. Kaimowitz (1995: 48) contends intensification at the forest margin could conceivably increase deforestation if it made cattle farming more profitable.

We believe the debate over the utility of intensification - focused as it is on possibilities at the forest margin - is misplaced. Future research should focus on the possible forest management benefits of intensification near centres of population, not at the forest margin. We agree with the reasoning of Kaimowitz (1995: 20) who explains "Policy instruments which operate through livestock and forest product prices more likely influence the land use patterns of investment ranchers and ranchers in traditional livestock grazing areas than ranchers who live on the agricultural frontier".

### *What is the effect of road construction on broadleaf forest management?*

Road construction is associated with patterns of deforestation (Ludeke 1987: 76; Johnston *et al.* 1992: 61; Parsons 1993: 45; Rudel with Horowitz 1993: 8-9, 110-112; Utting 1993: 27; Chomitz and Gray 1995). It has been observed at some locations in Honduras that inadequate roads are a constraint to cattle farming (Hering and Jaendl 1993: 7; Humphries 1994: 51-52). Kaimowitz (1995: 4) urges that roads not be constructed

in the vicinity of broadleaf forest as one key way to diminish cattle-induced deforestation.

While we do not dispute that road construction has been an important factor contributing to broadleaf deforestation, we caution against prohibiting road construction in all cases. Economic development and non-forest income opportunities may in the future be one important way of attracting settlers out of the forest. Road construction and improvement may be a pre-condition for creating some of those opportunities.

We also wish to point out that, while roads are viewed by some as a stimulus to cattle farming, others say the absence of roads stimulates cattle farming. As explained by COHDEFOR/KFW (1992: 23):

Owing to the inaccessibility of the zone, the majority of the residents raise beef and swine in an extensive way... Owing also to the difficulties of transportation, the marketing of cattle and swine on the hoof offers considerable advantages, compared to the marketing of agricultural products that must be carried to the market.

Research on the relationship of roads to agricultural, infrastructural and economic development is necessary for sound forest management planning.

### *To what extent could the problem of broadleaf deforestation be resolved by attention to growth of the cattle sector?*

Some observers view cattle farming as the main cause of deforestation in Central America. For example, Ledec (1992: 27) maintains that "deforestation generally cannot be controlled unless the spread of cattle ranching is somehow controlled". In contrast, Nicholson *et al.* (1995: 722) view cattle ranching as a symptom, rather than a cause, of deforestation. They contend poverty and migration to the agricultural frontier starts the process of deforestation, and cattle ranching is only an after-effect. Nicholson *et al.*'s point is well taken, but they fail to observe that, in many areas, the expansion of cattle ranching at locations distant from the forest may be an important cause of poverty and migration to the agricultural frontier. The polar views of Ledec (1992) and Nicholson *et al.* (1995) raise interesting research questions including:

- To what extent can the problem be resolved by attention to cattle sector alone?
- If forest dwellers are effectively prohibited from raising cattle, will they remain in the forest and subsist exclusively on the production of basic grains, or will they tend to leave the forest because they have lost the economic security service of cattle?
- If forest dwellers produce basic grains (or other crops) in place of cattle, does this necessarily alleviate the problem of rapid broadleaf deforestation?

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## Appendix 1: Field Research Methodology

The field research was conducted over a three-month period from August to November 1994. We assessed the effects of the AML on cattle-induced deforestation at two levels of analysis. First, we interviewed key informants at the national and departmental level, primarily to get their views on the positive and negative effects of the AML. Second, we conducted research in forest communities to test the validity of "expert" views on the effects of the AML and to learn the socio-economic status and opinions of the respondents.

We are mindful of the limitations of using expert interviews to assess the effects of a sectoral adjustment policy on pasture-to-forest conversion. Institutional and personal biases can colour perceptions and opinions are sometimes less reliable than quantifiable data. However, there are strong compensating factors in this methodology. First, the respondents have a wealth of knowledge and first-hand experience of the subject matter investigated that are simply not obtainable except through interviews. Second, the respondents can convey a wealth of qualitative insights and unanticipated perspectives that cannot be captured through quantitative analysis. Third, expert interviews provide early insights at a time (two years after the enactment of the AML) that is perhaps too early for a comprehensive assessment of the effects of adjustment policies.

Below we explain the approach taken in the "key informant" and "case study" dimensions of the research.

### Key Informant Survey

Interviews were conducted with 50 policy makers, planners and leading national experts in the forest and livestock sectors. Most worked at the national level; a minority were based in the Department of Olancho. [See list of informants in Appendix II.]

A semi-structured interview format was used to assess the informants' knowledge and views in their areas of specialisation. Questions on the general issue of livestock-led deforestation and the AML were posed to all respondents. Certain forestry-related questions were posed only to forestry specialists and, likewise, certain livestock questions were posed only to experts in that field. This dimension of the research sought to attain a qualitative rather than a quantitative understanding of the issues.

### Three case studies in Olancho

The three sites (A, B and C) are located along the north-south "agricultural frontier" in the broadleaf forests of eastern Olancho (see figure 4). They are in the Municipalities of San Esteban (Site A), Catacamas (Site B) and Froylan Turcios (Site C).

The sites were chosen according to the following criteria: (1) that there be a significant number of households at the site that have at least one head of cattle; (2) that the site be situated within the broadleaf forest; (3) that the number of households at each site be no more than 120; and (4) that there should not have been a household survey conducted at the site within the last year.

A census was conducted of all households at the three sites. Among the 201 households surveyed, 70 had one or more head of cattle and were considered "cattle" households; the remaining 131 had no cattle at all and were considered "non-cattle" households.

It was decided to conduct an in-depth survey at all "cattle" households and at half the "non-cattle" households. Owing to absences and some instances of non-cooperation, we were able to interview 64 (91 per cent) of the 70 livestock households and 63 (48 per cent) of the 131 non-livestock households. The head of household was the respondent in the household survey.

The survey was used to obtain basic socio-economic data on the household and to assess the views of the heads of household on cattle farming and forest management. It is not assumed that the villages represent all villages in the broadleaf forest in a statistical sense. The number of villages in the study is too small to achieve this purpose. Rather, it is assumed the sites and households provide preliminary and indicative information on the issues being investigated.

## Appendix 2: Respondents in Survey of key Informants

Nelson **Agudelo**, Sub-Director, Dept. of Natural Resources and Biological, Conservation, EAPZ

Miguel **Alvarado Rivera**, Head, Planning Dept., COHDEFOR

Carlos Humberto **Amador Cámbar**, Director, National Agrarian Institute, Olancho

Victor Leonel **Archaga**, Head, Dept. of Protected Areas and Forest Life, COHDEFOR

Ricardo **Arias**, Executive Secretary, UPSA

Juan **Blas Zapata**, Vice-Minister, SEDA

Rigoberto **Bodas**, Representative, Grupo Ecológico de Olancho (GEO)

Julio **Cabrera**, President, FECAD and General Secretary of Consejo Nacional Campesino

César Augusto **Cálix**, Regional Manager, Banco del Ahorro Hondureño

Edíl **Cárcamo**, Local Civil Authority, San Esteban, Olancho

Randolfo **Cruz**, Ranch Manager, Industrial Cattle Ranchers' Group

Ramón **Díaz López**, Mayor of Catacamas, Olancho

Aníbal **Espinal**, Cattle Rancher, San Esteban, Olancho

Emil **Falck**, Advisor to the Director, National Agrarian Institute

Mayra **Falck Flores**, Specialist in Agrarian Policy, EAPZ

Raf **Flores**, Coordinator, Project for Environmental Development in Honduras, SEDA

Oscar **Flores**, Head, Dept. of Promotion & Extension, COHDEFOR

José **Flores Rodas**, Head, Natural Resources Unit, PRODEPAH

Atilio Ortiz **Fúnez**, General Manager, SILVIAGRO

Rolando **García Díaz**, Sub-Director DIRCO, Secretariat for Natural Resources

Gaston **Grenier**, Co-Director, Guayape Project

Manuel **Hernández**, Director, ESNACIFOR

Cristino **Herrera**, Secretary of Education, Asociación Campesina Nacional

Marcial **Jara Almonte**, Ex-Official, IICA, Livestock Sector

Siefried **Kastl**, Principal Technical Advisor, CAFOR GTZ/COHDEFOR Project

Iván **Madrid**, Manager, Fondo Ganadero

Renán **Mairena**, Head, Dept. of Norms and Control, COHDEFOR

Miguel **Martínez**, Manager, Banco Atlántida

Arnaldo Renán **Mejía**, Assistant for Protected Areas, COHDEFOR

Rafael **Méndez Hernández**, Cattle Rancher, San Esteban, Olancho

Rigoberto **Mercado**, Cattle Rancher

José Arnulfo **Messen**, Coordinator, Protected Areas of Olancho and the Mosquitia, Dept. of Protected Areas, COHDEFOR

Alonso **Moreno**, Project Director, EAPZ-GTZ

Oswaldo **Munguía**, Director, MOPAWI

Enrique Elvir **Ortega**, Head, Technology Transfer Section, Dept. of Promotion & Extension, COHDEFOR

Hernando **Palma**, Assistant Executive Secretary, UPSA-SRN

Jorge Alberto **Palma**, Administrator, LUPE Project

Carlos **Pineda Escoto**, Forestry Consultant

Arturo **Rodríguez Torres**, Sub-Director COHDEFOR, Juticalpa

Hortensia **Rosales de Zelaya**, Sawmill Administrator, Catacamas, Olancho

Santiago Efraín **Ruiz**, Forestry Economics Consultant

Rigoberto **Sandoval Corea**, General Manager, COHDEFOR

René **Serrano**, Executive Director, AMADHO

Pedro **Sevilla**, President, FENAGH

Jenny Elizabeth **Suazo N.**, Independent Consultant

Mario **Vallejo**, Coordinator, Proyecto MADELEÑA III

Rafael Emiliano **Verdial**, President, Cattle Ranchers' Association of Sula

Ramón **Villeda Bermúdez**, Minister of Natural Resources

Ian **Walker**, Manager, ESA Consultants

Héctor Antonio **Zelaya Cálix**, Owner, Dairy Enterprise

### Appendix 3: List of Abbreviations

AMADHO	Asociación de Madereros de Honduras. (Honduran Timber Association.)
COHDEFOR	Corporación Hondureña de Desarrollo Forestal. (Forestry Corporation of Honduras.)
EAPZ	Escuela Agrícola Panamericana Zamorano. (El Zamorano Pan-American Agricultural School.)
ESNACIFOR	Escuela Nacional de Ciencias Forestales. (National School of Forestry Sciences.)
FENAGH	Federación Nacional de Agricultores y Ganaderos de Honduras. (National Federation of Honduran Farmers and Ranchers.)
GTZ	German Agency for Technical Cooperation. (Deutsche Gesellschaft für Technische Zusammenarbeit).
IICA	Instituto Interamericano de Cooperación para la Agricultura. (Inter-American Institute for Cooperation in Agriculture.)
INA	Instituto Nacional Agrario. (National Agrarian Institute.)
LUPE	Land Use Productivity Enhancement Project
MOPAWI	Mosquitia Pawisa.
PRODEPAH	Proyecto para el Desarrollo de Políticas Agrícolas de Honduras. (Project for the Development of Agricultural Policies in Honduras.)
SECPLAN	Secretariat for Planning, Coordination, and Budget
SEDA	Secretaría de Estado en el Despacho del Ambiente. (State Secretariat for the Environment.)
UPSA	Unidad de Planificación Sectorial Agrícola. (Unit for Agricultural Sector Planning.)



## **Appendix 4: Some Recent Changes in the Honduras Cattle Sector**

In the survey of key informants at the national and departmental (Olancho) level, respondents who are experts on the cattle sector were asked about changes in the sector in the last ten years. Their answers serve as a basis for a general description of those changes.

In the last ten years there has been a general increase in the size of the national herd (see Tables 1 and 2) and the condition of the cattle economy has improved. The principal factors that have led to this growth and improvement are: (1) the ability of certain cattle ranchers to acquire land at a cheap price; (2) state support to the cattle sector in the 1980s; and (3) introduction of studs and the practice of artificial insemination.

According to the respondents, the size of the national herd has decreased somewhat in the last several years because of the following factors. First, the increased price of cattle has led to greater sales. Second, the rate of reproduction of the herd has decreased because of diminished state support to the sector. Third, the opening of markets has led to the sale on-the-hoof to neighbouring countries.

On average the genetic quality of the national herd has improved in the last ten years, especially in the dairy industry. Recently, improvements have occurred above all for meat cattle because of the fall of dairy prices.

The location of the national herd has changed in the last three decades. The programme of agrarian reform (initiated in 1962) caused a decrease in the quantity of cattle in the departments of Choluteca, Comayagua and El Paraíso. (This effect stopped in 1974-75 and now the quantity of cattle is increasing in those departments.) In part because of the migration of cattle owners out of those departments, cattle farming increased in the departments of Yoro and Colón. The growth of cattle farming in Olancho resulted above all because it was seen as an area of agricultural expansion and because there are parts of the department that are more appropriate for cattle farming than for agriculture. During the civil war in Nicaragua, the quantity of cattle rose in part because Nicaraguan herds were transferred to Olancho. Olancho and Choluteca have maintained their status as the centres of meat production, whereas the centres of dairy production are to the north near the Atlantic coast.

There was no consensus among the informants on patterns of consumption of meat in Honduras in the last ten years. Some said domestic sales of meat had increased because of the overall growth of the national population. Others said domestic sales had fallen in recent years as a result of increased meat prices.

In the last two years, there has been much marketing of cattle on-the-hoof to Guatemala, El Salvador and Mexico as a result of the opening of markets. Cattle producers wish to take advantage of prices that are 30 to 40 per cent higher in neighbouring countries. Moreover they are seeking to avoid paying to the State taxes on the sales of cattle; these taxes can easily be avoided by selling on-the-hoof. One of the informants commented that this change in the cattle economy has increased incomes to cattle farmers. Nevertheless the country is suffering from a loss of foreign exchange and employment because of the loss of added-value associated with this practice.