

## Economic crisis, small-scale agriculture, and forest cover change in southern Cameroon

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### Summary

The rate of forest cover loss in the humid tropics of Cameroon is one of the highest in Central Africa. The aim of the large-scale, two-year research project described here was to understand the effect of the country's economic crisis and policy change on small-scale agricultural systems and land-clearing practices. Hypotheses were tested through surveys of more than 5000 households in 125 villages, and through time-series remote sensing analysis at two sites. The principal findings are that: (1) the rate of deforestation increased significantly in the decade after the 1986 onset of the crisis, as compared to the decade prior to the crisis; (2) the main proximate causes of this change were sudden rural population growth and a shift from production of cocoa and coffee to plantain and other food crops; and (3) the main underlying causes were macroeconomic shocks and structural adjustment policies that led to rural population growth and farming system changes. The implication of this study is that it is necessary to understand and anticipate the undesirable consequences of macroeconomic shocks and adjustment policies for forest cover. Such policies, even though they are often not formulated with natural resource consequences in mind, are often of greater relevance to the fate of forests than forest policy.

*Keywords:* deforestation, agriculture, economic crisis, structural adjustment, Cameroon, Africa

### Introduction

Cameroon's estimated 17 million ha of humid tropical forest, covering the southern third of the country, is about one-tenth the area of such forests remaining in the Congo Basin of Central Africa (Laporte *et al.* 1998). Annual deforestation in Cameroon is estimated to range between 80 000 to 200 000 ha<sup>2</sup> (Ndoye & Kaimowitz 2000), or 0.4–1.0% of forest cover. Population growth and shifting cultivation tend to be viewed as the main cause and agent, respectively, of deforestation in Cameroon (Amelung & Diehl 1992; Hoozeveld & van Soest

1993; Thiele & Wiebelt 1994). Other factors include logging (Amelung & Diehl 1992; Thiele & Wiebelt 1994), the construction of transportation infrastructure (Mamingi *et al.* 1996), and the establishment of agricultural plantations.

During the decade prior to 1986, Cameroon had a booming economy with most foreign exchange revenue coming from petroleum, cocoa and coffee. Annual real GDP growth averaged 7% from the late 1970s through to 1985 (EIU 1997). Beginning in 1986, foreign exchange revenue fell dramatically because of a decline in the world prices of oil, cocoa and coffee, and because of diminishing supplies of Cameroonian oil, amongst other reasons. In the period 1987 to 1993, average annual GDP change was negative (EIU 1997). In 1989, the purchase prices of cocoa and coffee were halved by the government and subsidies were greatly reduced. Production of these crops plummeted afterwards, greatly adding to the progressive impoverishment of the country. A 50% currency devaluation of the CFA Franc in January 1994 has partly restored the competitiveness of Cameroon's exports and economic growth. In the period 1994/95 to 1996/97 average annual GDP growth has been positive and on average 1.7% (EIU 1998). One of the aims of this study was to assess the effects of a devastating economic crisis on the process of deforestation in Cameroon.

A key assumption behind the present study is that the impact of macroeconomic change since 1986 has been so dramatic and pervasive that effects on population, migration patterns, and small-scale agriculture have been unavoidable, and this in turn has affected the rate of deforestation. It is clear the crisis created a need for supplementary foreign exchange income, and that the subsequent currency devaluation greatly boosted timber exploitation and export (Eba'a-Atyi 1998), but it is not yet clear how these same forces have affected the relationship between small-scale agriculture and forest cover change.

The specific objectives of this study were to test three hypotheses related to the effects of the economic crisis in Cameroon.

### More deforestation after than before crisis

The first hypothesis was that the average annual rate of net deforestation in the humid forest zone (HFZ) of Cameroon increased in the decade after the onset of the crisis in 1986 as

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compared to the decade before. The reasoning behind this is that the population of villages in the HFZ is likely to have increased as a consequence of macroeconomic change in the period of the crisis (see below) and a shift probably occurred from small-scale production of tree crops (cocoa and coffee) to production of food crops (see below). In a 110 000 ha block in the region of Bertoua (East Province), the average annual rate of net deforestation doubled in the period 1986–96 as compared to the period 1973–86 (Mertens & Lambin 2000). This is not proof that the rate of deforestation has increased in the HFZ as a whole. The data for Bertoua do not take into account the gradient of rates of deforestation associated with distance from major metropolitan areas, economic opportunities like logging, and proximity to savannas where population density is higher.

### Slowing of rural to urban migration

The second hypothesis was that migration from rural to urban areas has slowed, and population in the villages has grown, but there has been no net 'return' migration (that is, an excess of migration to the villages over migration from the villages). Increase in the village population is likely to have led to increased forest clearing to the extent that additional village residents were involved in agricultural production. Amongst the pieces of evidence supporting increase in urban to rural migration and in the rural population are the following. The boom period supported rapid increases in urban employment and in the period 1976–87 the population of the capital city (Yaoundé) grew 107% (MINPAT 1985, 1987). However between 1983 and 1993, urban poverty increased from 1% to 20% of the population, and in the same period, unemployment rose from 7% to 24% (Banque Mondiale 1995). Through pressure from the World Bank and the International Monetary Fund, public sector employment was reduced in 1991–92 and draconian public sector wage cuts were made in 1993. Research conducted by Gubry and Lamle (1996) detected 'return' migration to the countryside in the West and North provinces outside of the HFZ. We assumed that outmigration would continue to exceed immigration in the villages, in other words that net outmigration would continue in spite of the crisis, because of the presumed persistence of certain advantages in rural–urban migration such as higher income.

### Shift from export crops to food crops

The third hypothesis was that between the years prior to the crisis and the present, cocoa and coffee crops have stagnated, especially in terms of area increases. Farmers have made up the slack through increased production and marketing of food crops, especially of plantain, which is usually produced in primary forests. Production and export of cocoa and coffee declined precipitously after 1989, in response to the government cut of producer prices and subsidies (Losch *et al.* 1990; Courade & Alary 1994; EIU 1995; Janin 1996; Mama 1996). Between 1989 and 1993, the marketing of food crops increased at one-third of sampled farms (Courade & Alary

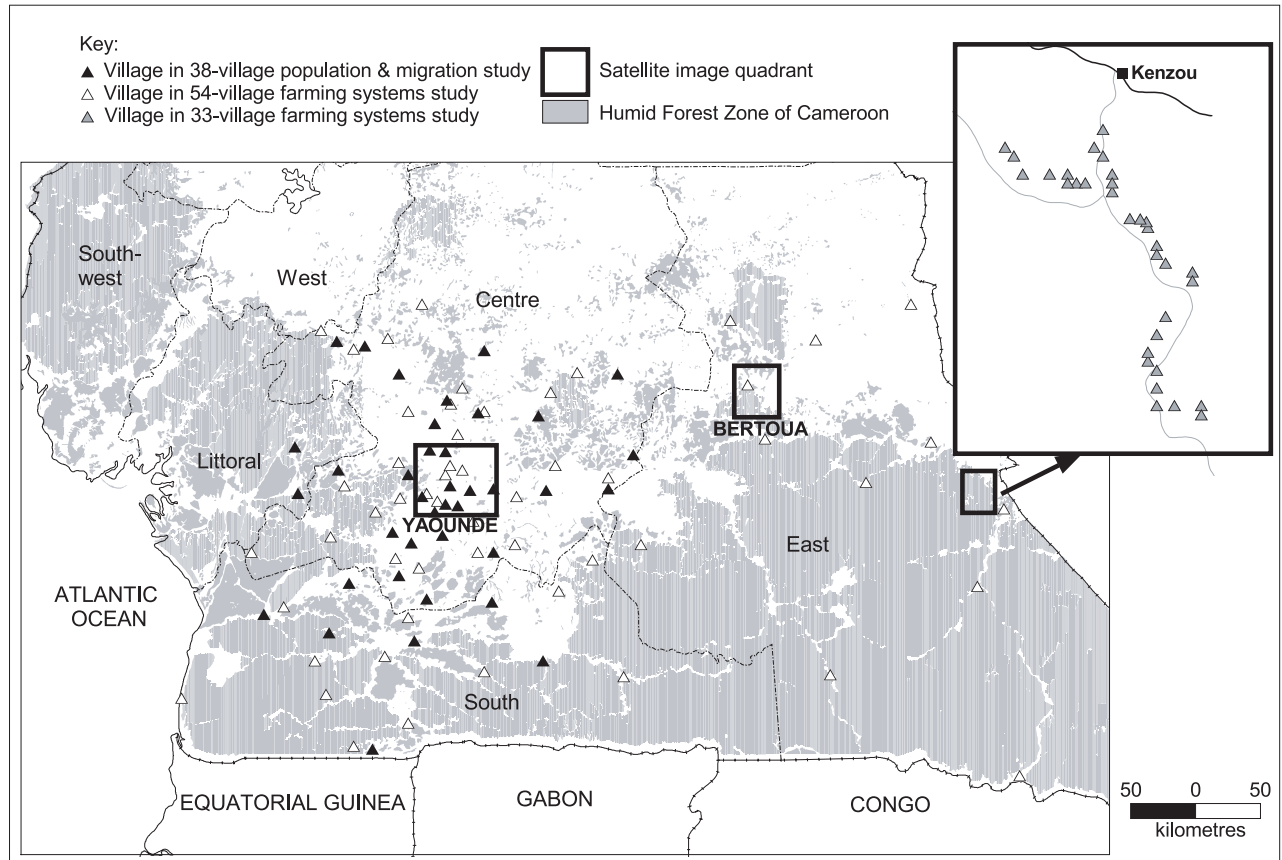
1994). Furthermore, Heidhues *et al.* (1994) state that production of plantain increased noticeably between 1987 and 1992, and Gockowski *et al.* (1998) indicated that collapse of plantation-crop prices induced a shift of labour into plantain and cocoyam production. The shift from perennials to food crops should have increased the rate of forest clearing because food crops are more land extensive (in the sense of requiring fallow land) and tend to require more sunlight (Ndoye & Kaimowitz 2000).

### Methods

Changes in socio-economic and remote sensing data with respect to key reference years were observed. The years were: 1985 and prior years, which marked the period before the onset of the economic crisis; 1986–93, which marked the period when the crisis was underway yet the 1994 currency devaluation had not yet happened; and 1994–97, which marked the period after implementation of the currency devaluation. Socio-economic information had to be gathered because Cameroon has not conducted a national census since 1985. The independent variables (status and activities of forest clearing agents) were measured through socio-economic field survey data. The dependent variable (quantitative and qualitative change of forest cover over time) was measured chiefly through satellite imagery, and corroborated through the field survey data.

The first hypothesis was tested through measurement of forest cover change at one peri-urban site on the periphery of Yaoundé and at one remote rural site in the Ndélélé block of the East province, bordering on the Central African Republic (Fig. 1). This was done to take into account the variation in deforestation patterns with respect to distance from urban areas. The analysis of the Yaoundé peri-urban area involved use of two Landsat satellite images from 1973 and 1988, and two SPOT images from 1987 and 1995, and covered an area of approximately 42 000 ha. These images were matched to socio-economic data on six of the 38 villages in the population and migration survey (see below). The study of the Ndélélé area involved the use of Landsat satellite images from 1973 and 1986, and SPOT images from 1991 and 1996; it covered approximately 70 000 ha. The Ndélélé images were matched to a socio-economic survey covering 33 villages and 552 households (see below).

The second hypothesis was tested through a socio-economic survey of population and migration trends in all 4078 households in 38 villages in the Centre and South provinces (Fig. 1). These 38 villages are the same as those researched by Franqueville (1987) in a 1974–75 field study on population and migration trends. We replicated Franqueville's (1987) study to measure changes prior to the onset of the crisis (1974–75) and after the onset of the crisis (1997). Migration data were collected on all household members who had been born in the villages, and on all full sons and daughters of the head of household who had been born in the villages, regardless of their place of residence at the time of the interview. Of



**Figure 1** Research villages and satellite image quadrants in the Humid Forest Zone of Cameroon.

particular importance were data collected on the place of residence of long-term migrants (those who had ever lived outside the village for a continuous period of six months or longer) in 1977, 1982, 1987, 1992 and 1997.

The third hypothesis on farming systems was tested through analysis of data from three socio-economic surveys. The surveys were: the 38-village survey described above; a sample survey of 54 villages (648 households) in the Centre, South, and East provinces; and the 33-village (552 households) Ndélélé survey in the East province mentioned above (Fig. 1). All three surveys involved asking respondents if their planted area of cocoa, coffee, plantain, and non-plantain food crops were larger, the same, or smaller in 1993 as compared to 1985 (initial crisis effect), and in 1997 as compared to 1993 (devaluation effect). In the 54-village and 33-village surveys, additional questions were posed concerning changes of production and marketing of these crops between 1993 and 1985, and between 1997 and 1993. In all three surveys, questions were asked concerning forest land cleared by the household in 1996 or 1997; in particular, we sought to know the area of forest cleared, whether it had been primary or secondary forest, and whether a chainsaw had been used.

## Results

### Deforestation patterns

The peri-urban Yaoundé satellite imagery data show that the average rate of annual net deforestation increased by a factor of two in the period 1987–95 as compared to the period 1973–88. The Ndélélé satellite imagery data show that the average rate of annual net deforestation increased by more than four times in the period 1986–96 as compared to the period 1973–86. These findings, together with those of Mertens and Lambin (2000) in Bertoua, demonstrate that net deforestation increased in the HFZ in the period of the crisis, and in a range of conditions with respect to distance from the major metropolitan area.

### Population movement patterns

On average the population of the 38 population and migration villages increased greatly in the period of the crisis. In the period prior to the crisis (1976–87), the overall population of the study villages grew from 15 616 to 16 910 (by 8.3% or 0.7% per year), whereas in the crisis period (1987–97), the population grew from 16 910 to 24 610 (by 45.5% or 4.1% per year). However, one of the 38 villages

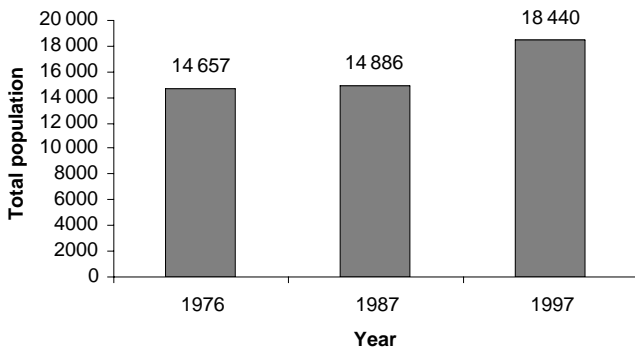


Figure 2 Total population in 37 of 38 population and migration villages, in 1976, 1987, and 1997.

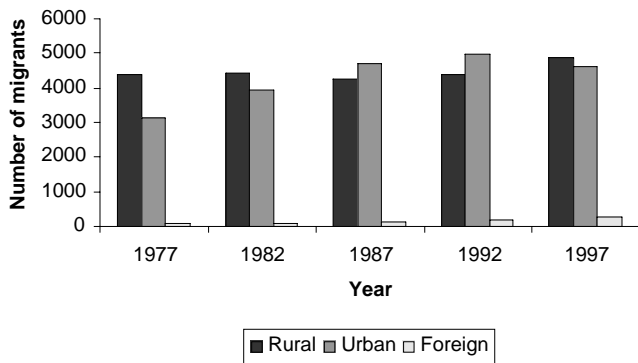


Figure 3 Destinations of long-term migrants in 1977, 1982, 1987, 1992 and 1997.

closest to Yaoundé (Ngoulemakong) is large (one-fifth of all people in the data set), has become a part of metropolitan Yaoundé and is no longer a rural village as such. The tripling of the population of Ngoulemakong is best characterized as urbanization and not growth of a rural village. However, even if Ngoulemakong is removed from the calculation, the population in the remaining 37 villages grew from 14 657 to 14 886 in the 1976–87 period (1.6% overall), and from 14 886 to 18 440 in 1987–97 (23.9% overall) (Fig. 2).

Data on the destinations of long-term migrants born in the 38 study villages help understanding of the reasons for increasing rural population in the crisis period (Fig. 3). In the period encompassing the economic boom (1977–87) and after (up to 1992), the urban destinations grew steadily in absolute terms and relative to rural destinations. Note that rural destinations exceeded urban destinations in 1977 and 1982, but urban destinations overtook rural destinations from 1987, a pattern which lasted until 1992. An important reversal occurred at some point between 1992 and 1997; urban destinations declined and rural destinations increased, and rural destinations once again exceeded urban destinations.

The hypothesis was that there would be no net ‘return’ migration from urban to rural areas in the period of the crisis and this proved to be wrong. There was net outmigration from the villages in the period 1978–92, but this diminished

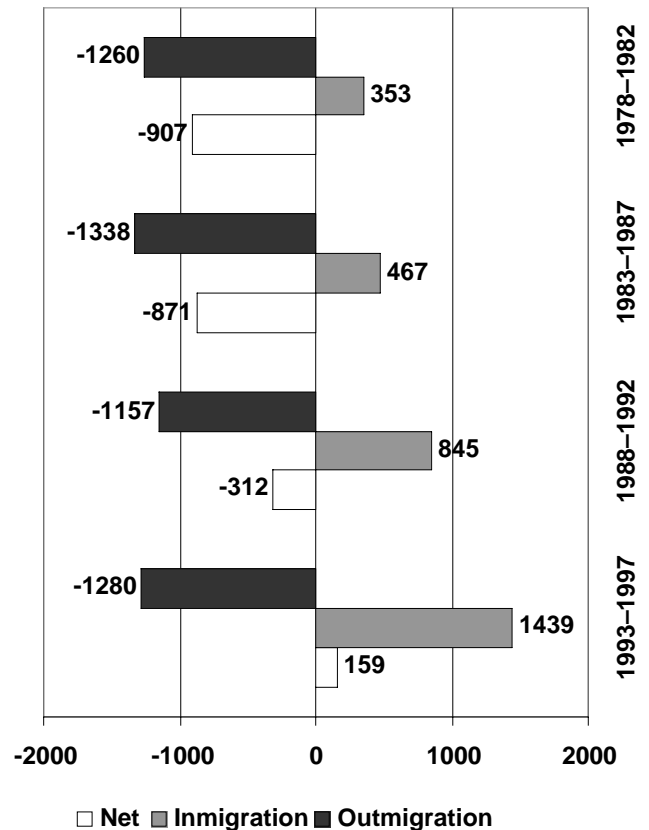


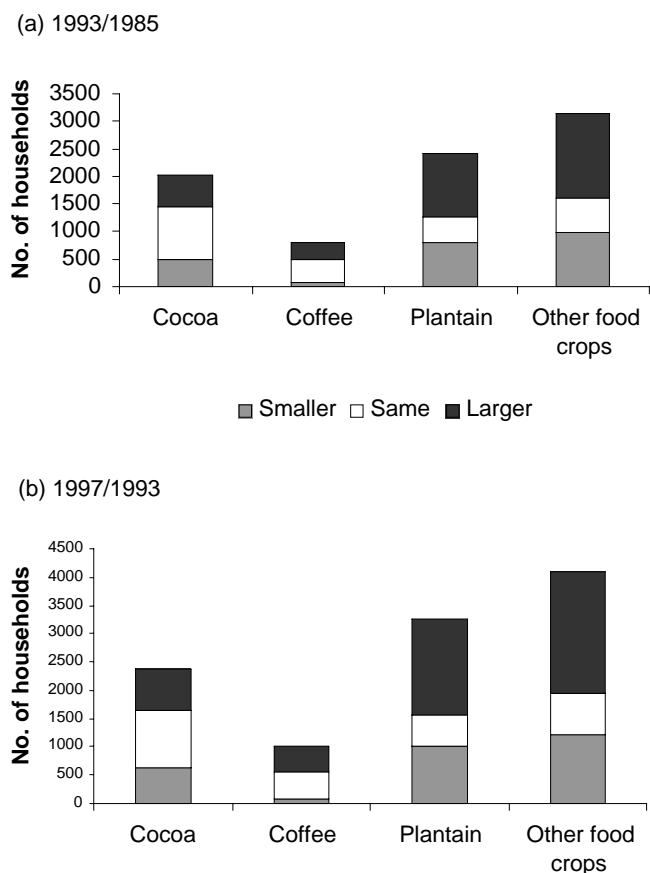
Figure 4 Number of outmigrants (–), immigrants (+), and net migration balance (– or +) in the 38 study villages, 1978–97.

with the passage of time (Fig. 4). Beginning in the period 1993–97, immigration exceeded outmigration for the first time. Note the important fact that outmigration was more or less constant from 1978–1997, whereas immigration grew steadily and quadrupled between the first period (1978–82) and the most recent period (1993–97). Population growth in villages in the HFZ need not necessarily imply forest cover loss. However we assume that it did because the number of farming households grew in absolute terms (Pokam & Sunderlin 1999), a change that tends to put additional pressure on forests, even though farming households declined as a proportion of all rural households.

### Shift from export crops to food crops

In the last two decades there has been a large-scale shift away from high dependence on tree crops (cocoa and coffee) and toward food crops, principally plantain. In general terms, therefore, the third hypothesis has been upheld by the findings. Whereas in 1974–75, the primary activity of 83% of heads of household in the 38 population and migration villages was planter (producer of cocoa and/or coffee) and only 7% were cultivators (producers of food crops), in 1997

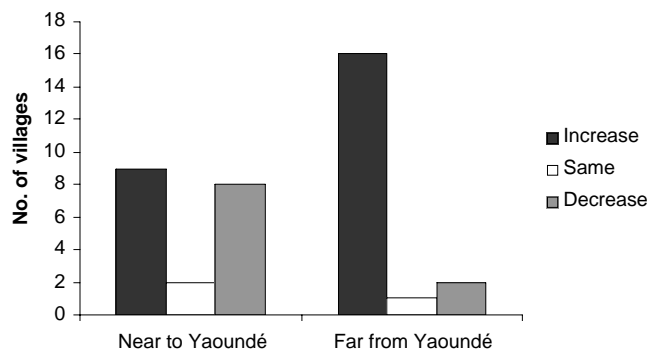




**Figure 5** Responses to the question ‘Was the area of your cocoa/coffee/plantain/other food crops larger/the same/smaller (a) in 1993 relative to 1985? (b) in 1997 relative to 1993?’

the proportion of planters had decreased to 27% and that of cultivators had increased to 33%.

This change can also be seen (though not to the same degree) in data on the change of area allocated to tree crops and food crops over time. Figure 5 shows the changes in relative areas of particular crops. In the initial period of the crisis, there was a tendency toward stagnation for both cocoa and coffee, with about half of all households producing these crops (47% and 55% respectively) showing no change of the planted area between the two years (Fig. 5a). However the trends for cocoa and coffee differ. For cocoa, the percentages of households increasing (29%) and decreasing (24%) their cocoa area largely cancelled each other out, whereas for coffee, there were three times more households increasing their areas (37%) compared to those decreasing them (12%). The areas of plantain and non-plantain food crops showed a strong tendency toward growth. Approximately half of all households producing plantain (47%) and non-plantain food crops (49%) expanded their area of these crop types. For only one-fifth of all households producing plantain (19%) and non-plantain food crops (19%) did the areas remain the same (Fig. 5a). The strong tendency toward growth for these crop



**Figure 6** Classification of 38 villages by distance from Yaoundé and by tendency of plantain area to increase, decrease, or remain the same.

types is volatile, in the sense that about a third of all households producing these crop types (34% for plantain and 32% for non-plantain food crops) showed a decrease in area.

The period of currency devaluation shows the same basic tendencies, but with the following differences. For all crop types, the percentages of households increasing their areas rose, and the percentage of households showing no change in areas decreased, albeit by very little. For all crop types except cocoa, the percentage of households decreasing their areas declined, although again this decline was very small (Fig. 5b).

When the 38 villages were cross-classified by their overall area change tendencies, and by their distance (near or far) from the capital city Yaoundé, the ‘volatile’ towns (those with increases and losses of food crop area tending to cancel each other out) were found to be concentrated near Yaoundé, whereas the towns showing growth of food crops tended to be away from Yaoundé (Fig. 6). This has strong implications for forest cover loss, inasmuch as the towns furthest from Yaoundé tended also to be those with the most remaining forest cover (Fig. 1).

It was stated earlier that between 1974–75 and 1997, the percentage of heads of household with ‘planter’ as primary activity dropped from 83% to 27%. Why is this precipitous drop not reflected in the data on area change? Specifically, why do the areas of cocoa and coffee show an overall tendency to stagnate, rather than toward dramatic decrease? The reason is that after the decrease by roughly half of the prices of cocoa and coffee in 1989 and the removal of government subsidies for inputs, most farmers ceased harvesting these tree crops, but maintained or expanded their cocoa and coffee areas in the hope that the profitability of these crops would be restored at some point in the future. This had strong implications for the increased rate of deforestation in the crisis period.

## Discussion

In the foregoing we have argued that the rate of net deforestation in Cameroon’s HFZ increased during the economic crisis and that this change was propelled by two crisis-related

factors, namely rural population increase and increased cultivation of food crops. There are four other crisis-related factors that are connected to, but not encompassed in, the three hypotheses discussed above, that must be mentioned to round out our understanding of the conditions that led to increased forest clearing. First, food imports to Cameroon declined substantially during the crisis and this boosted demand for food crops produced within the country (Ndoye & Kaimowitz 2000). Second, a government phase-out of subsidies for agriculture (e.g. fertilizers, pesticides and herbicides) in 1989–92 and the increased cost for these inputs constrained their use, making agriculture more extensive. Third, it is important to note that a flexible gender division of labour in farm households enabled the surge in production of food crops. Prior to the economic crisis, men were involved almost exclusively in the production of cocoa and coffee (as cash crops) and women were involved almost exclusively as producers of food crops (as consumption crops). As the crisis progressed, many men changed to food crop production, though food crops are still dominantly produced by women (Pokam & Sunderlin 1999). Fourth, logging was accelerated after the currency devaluation (Eba'a-Atyi 1998), and particularly in the East province, a process that has tended to facilitate migration, colonization, and clearing of agricultural lands.

How can we confidently assume that the economic crisis contributed significantly to the detected increase in net deforestation? How can we be sure that the increased rate of net deforestation was not caused exclusively or mainly by socio-economic factors that either pre-date, or are unrelated to the crisis? Although there is no definitive way to reject alternative explanations, we believe our argument is sound for two reasons. First, we know of no plausible rival explanations, other than the economic crisis and structural adjustment policies, for why population and migration patterns and farming systems changed in the ways described in this paper after 1986. Second, we believe there are no alternative convincing arguments, other than those concerning the observed changes in population and farming systems, for the significantly increased rate of net deforestation in forest villages.

There is limited utility in comparing our findings to regional case studies because recent scholarship has argued convincingly that research in West Africa has greatly exaggerated the extent of deforestation and has misunderstood the causal relationship between people and forest cover change (Fairhead & Leach 1998). Our findings concur with Fairhead and Leach's (1998, p. xiv) questioning of the commonplace view that population growth and deforestation are linked one-way processes. The pace of net deforestation in the HFZ was relatively slow during the oil boom (late 1970s and early 1980s) when rural–urban migration rates were high, rural population growth was low, and agriculture was dominated by tree crops. Net deforestation then accelerated during the crisis through slowed rural–urban migration, the turn toward net return migration, and increased food crop production. Our findings not only question the conven-

tional view that African deforestation is fundamentally a consequence of growing numbers of rural households driven by high levels of natural fertility (e.g. Anderson & Fishwick 1984; FAO 1996; Bawa & Dayanandan 1997; Kant & Redantz 1997), but also question the assumption that population is an independent variable operating by a logic of its own. We argue that population, and likewise farming systems, are best viewed as intermediate variables influenced in part by macro-economic conditions and policies.

A study on the effects of economic crisis in Indonesia also found that forest clearing by small farmers increased during the period of the crisis (Sunderlin *et al.* 2000). However, the changes in farming systems leading to increased forest clearing in Indonesia were fundamentally different. Whereas in Cameroon the prices of export crops decreased prior to the 1994 devaluation, encouraging cultivation of food crops, in Indonesia the prices of export crops generally increased, encouraging increased attention to these crops. An additional reason for forest clearing in the Indonesian case was increased cultivation of rubber, the price of which did not rise during the crisis; however the area of rubber was expanded nonetheless as a consequence of the non-perishability of the product, because it can be harvested during most of the year, and other features of this crop that favour household security. The comparative lesson to be drawn is that it is not the direction of relative price change between export and food crops that matters with respect to forest cover change, but rather the destabilization of small farmer livelihoods. Under conditions of abrupt and dramatic price changes, small farmers will tend to clear more land to produce a new source of income, increase income from a proven source, increase attention to crops that favour household security, or take advantage of new income earning opportunities.

In summary, the rate of average annual net deforestation in Cameroon's HFZ has increased substantially in the period of the crisis, as compared to the period prior to the crisis. The proximate causes of this change were increased rural population, growth in the number of farms, increased demand for food crops with the decline in food imports, and a massive shift from production of tree crops to food crops. The latter had negative consequences for forest cover, because food crops tend to be more land-consumptive than tree crops, and because new food-crop production tended to be established on newly-cleared forest land rather than in place of cocoa or coffee orchards. Other factors involved were increased intensification of farming systems and the increased intensity of timber exploitation, which enabled new settlements to be formed and facilitated land-clearing.

These factors were enhanced by abrupt changes in macro-economic conditions and by structural adjustment policies aimed at addressing the crisis conditions. The implication of these findings is that a wide gamut of policies which are not typically considered to be relevant, for example exchange rate, trade, urban employment, and infrastructure policies, must be taken into account and modified, if the goal of reducing inappropriate deforestation is to be taken seriously. Deforestation

is a process rooted in the totality of both sectoral and extra-sectoral influences that condition the fate of tropical forests and their people. Policy solutions must reflect that understanding.

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