

## The role of population growth and land-use policy in deforestation: a case study in the western Venezuelan plains

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### Abstract

The western plains have shown the highest rates of population growth in Venezuela over the last 50 years. This was mainly due to the immigration of landless farmers coming from the Andean zone and neighbouring Colombia. The agrarian reform of 1960 assigned large areas of public forest in the study area to colonization programmes. In the 1950s and 1960s four permanent forest estates (PFE) covering some 1.000.000 ha were set aside to sustain timber production. In the meantime, it has turned out that both management practises and forest legislation are inappropriate to preserve the forests of the western plains as viable timber resources. As available land for colonization programmes ran short, PFEs were increasingly perceived as alternative areas for farming. Thus, less than 40% of the declared PFE area has ever been subjected to logging under a concession system, the remaining part was invaded by landless farmers prior to the introduction of a concession system. The main factor responsible for the ongoing deforestation is the inability of the agrarian reform (1) to surmount disparity in land tenure and (2) to intensify agricultural production. The remaining forests in the study area could be only preserved by the elimination of the major shortcomings in land use policy identified in this paper, backed by a family planning programme to stabilize population size in the meanwhile.

**Keywords:** Agrarian reform; Demographic development; Forest management; Forest policy; Venezuela

### 1. Introduction

Deforestation in the tropics and its potential causes is the source of many debates. Some authors have identified population growth as the major agent of deforestation while others prefer putting population into a wider socioeconomic and political context (cf. Saxena et al., 1998). In Latin America, most research work on this subject deals with deforestation in the Brazilian Amazon. Here, tax holidays and fiscal incentives to cattle ranchers in order to develop the Brazilian hinterland rather than subsistence farming, have resulted in large-scale deforestation (Fearnside, 1993; Moran, 1993; Fearnside, 1997). In Venezuela, facing one of the highest rates of deforestation in Latin America over the last two decades (FAO, 1993, 1997), little has been published in international journals about the rationales leading to forest resource depletion.

The objective of the present report is to evaluate the factors responsible for large-scale deforestation in the western Venezuelan plains. Unlike in other rural areas of Venezuela, a comparatively large body of information about land-use history is available. This may be due to the relative accessibility and consequent early development of the study area.

## **2. The natural and political setting**

The plains (Spanish: 'Llanos'), covering about one-third of the total land area of 912.000 km<sup>2</sup>, constitute besides the Andes and coastal range and the Guayana-Shield, one of the three natural regions of Venezuela (Fig. 1). The annual precipitation ranges from 2500 mm near the piedmont of the Andes to 1250 mm in the easternmost part of the plains near the Orinoco-Delta (Veillon, 1989). The average annual temperature of about 25 °C varies only slightly in different parts of the region. There is a well-defined dry season from December to March. During that time trade winds coming from east-north-east prevail. In the remaining part of the year the region lies in the intertropical convergence zone with high rainfall.

The Venezuelan plains were formed as a pleistocene-holocene deposit area of Andean material. Many rivers originating in the Andes flow through the plains and eventually drain into the Orinoco river. The ongoing sedimentation process, particularly in the western plains, has formed a small-scaled microrelief ranging from well-drained, sandy-loamy levee sites to poorly-drained, clay-rich depressions that are flooded during the rainy season (Franco, 1979). The western part of the plains consists mainly of nutrient-rich alluvial soil, while the eastern part is characterized by nutrient-poor Ultisols and Oxisols (Beyer-Müntzel, 1983).

A contiguous belt of moist semi-deciduous forest with some patches of savanna and scrub vegetation ('chaparrales') stretches parallel to the Andes up to a distance of 150 km from the piedmont (Fig. 2). Further east this forest type, originally covering 4-5 Mio. ha, gives way to savanna and scrub vegetation and riverine and dry forest, respectively (Hueck and Seibert, 1981). The forests are rich in *Bombacopsis quinata*, a valuable medium-hardwood species. *Swietenia macrophylla* (mahogany) and *Cedrela odorata* (Spanish cedar) are the most precious timber species in this forest type. Both species are fairly rare but well-distributed components of the forest.

Venezuela has a Federal Constitution. A total of 22 federal states ('estados') constitute the Republic of Venezuela (Fig. 3). The federal states of Cojedes, Portuguesa, Barinas and Apure take a share in the western plains. However, the political power of these federal states is rather weak. For example, legislative and executive power in relation to resource management is exerted by the central government in Caracas. Also, revenues from taxation of natural resources are collected by the central government.

## **3. Causes of deforestation/degradation of forest resources**

A close look at the development of the western plains over the last 50 years reveals that there are three factors which have played a major role in forest resource depletion, viz. 'population growth', 'agricultural colonization initiated by the agrarian reform', and 'forest policy and management'. These factors, however, are not well-separated phenomena, but show interaction and, to some extent, synergistic effects.

### *3.1. Demographic development*

The economic growth owing to the oil boom and improved health care has led to an increase in population size from 5 Mio. in 1950 to 21.8 Mio. in 1995 (Table 1). In South America, only Paraguay shows a higher population growth than Venezuela (Statistisches Bundesamt, 1992). The population growth in the western plains was even higher than the overall figure for Venezuela (Table 2). The increase in population size in the study area is mainly due to the

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immigration of landless farmers from the overpopulated Andean zone and the socially instable Colombia. Both groups have been attracted by the large area of public forest stocking on relatively fertile soils. Thus, without offering industrial employment on a scale worth mentioning, the study area showed in 1961 an immigration/migration ratio as high as the Federal District (Caracas) (Table 3).

Table 1. Population growth in Venezuela from 1950-1995

	Population (in Mio.)	Average annual population growth
1950	5.0	-
1970	10.0	3.4
1975	12.7	3.2
1980	15.0	3.0
1985	17.3	2.8
1990	19.7	2.7
1995	21.8	2.6

Sources: Stat. Bundesamt, 1992; Ashoff 1992, FAO, 1997.

Table 2. Population growth in the western Venezuelan plains from 1950-1981

	Population	<i>Growth in %</i>	
		Study area	Venezuela
1950	214,499	-	-
1961	363,619	69.5	49.4
1971	563,018	54.8	42.5
1981	788,190	40.0	35.9

Source: Rojas, 1993

Table 3. States in Venezuela with the highest rate of immigration; index gives the immigration/migration ratio; figures refer to 1961

States	<i>Index</i>
Zulia	3.0
Portuguesa	2.7
Federal District	2.3
Barinas	2.0
Aragua	1.5
Carabobo	1.5

Source: Rojas, 1993

### *3.2. Agrarian reform*

The transition from the dictatorship of Pérez Jiménez to democracy in 1958 put pressure on the Acción Democrática (AD), the socialdemocratic party of Venezuela and winner of the first free elections, to prepare a comprehensive agrarian reform. The agrarian reform of 1960 came up as an ambitious programme aiming to improve all aspects of agriculture, including a better integration of the rural population into the socioeconomic and political development of the country. The right of landless farmers to be considered for land allocation is probably one of the most important articles in the law. Theoretically, all landowners who do not manage their farmholding properly are subjected to dispossession. But landholdings of 150 - 5000 ha in size, depending on site quality, are excluded from any kind of dispossession. This regulation reflects the experience with the first attempts of land reform in 1945 and 1948. In both cases, radical claims towards dispossession of large landholdings prompted a *coupe d'état* (Ade, 1992).

In the early 1960s, however, large private landholdings occupied by landless farmers were ceded to the agrarian reform by paying a compensation to the landowner. With time, such kind of land became scarce. Thus, mainly public land under forest cover could be considered for colonization programmes (Ade, 1992, pp. 63-67). The western plains provided the largest area of public land available for the agrarian reform (Fig. 4). In the study area, colonization started in the states of Portuguesa and Cojedes where the relatively advanced infrastructure meant low development costs. Only the construction of the Highway Barinas – San Cristóbal in 1964 and the eradication of malaria encouraged colonization of the densely forested parts of Barinas and Apure (Gutiérrez, 1996).

### *3.3. Forest policy and forest management*

In the 1950s and 1960s, the Venezuelan government set aside permanent forest estates (PFE) on public land to sustain timber production (Fig. 3). Originally, the four PFEs in the western plains, i.e. Turén, Ticoporo, Caparo and San Camilo, covered an area of about 1 Mio. ha (MAC, 1961). Natural forest management based on long-term licences (up to 40 years) started only in the early 1970s. In the lapse between the declaration of PFEs and the outset of a concession system, the accessible parts of Ticoporo and Caparo were already 'creamed' for mahogany and Spanish cedar.

In the meantime, it turned out that the management practises applied by the concessionaires have resulted in the degradation of forest resources. This development is encouraged by the legal framework. The major shortcomings are:

#### (1) Annual allowable cut

The determination of the annual allowable cut in the first cutting cycle is not based on long-term growth and yield studies, but on the volume of the most valuable timber species above the legal size. As these species occur rarely in lower size-classes, the removal of larger individuals result in a sharp decline or even the disappearance of species (Plonczak, 1989; Kammesheidt, 1994).

#### (2) Logging damage

Careless logging methods cause excessive damage on the residual stand. Growth modelling of logged-over stands suggest that the anticipated 30-yr cutting cycle does not provide sustainable yields in the long run (Kammesheidt et al., in prep.).

(3) Underpricing of forest resources

As taxes are levied in Bolívares (Venezuelan currency) which has been devaluating towards the US Dollar since 1982, royalties on logs have declined to an average of \$2/m<sup>3</sup> in 1993. In the same period, log prices for the most valuable timber species have remained stable or even increased. In 1994, fees were increased but to a level still far below the figures of the pre-devaluation period (Centeno, 1995). Moreover, the royalty system is based on wood actually harvested which encourages wasteful logging methods.

(4) Poor law enforcement

The small fee levied for supervision on any cubic metre harvested (US\$ 0.7) does not cover the costs. The deficit is balanced by the state budget (Centeno, 1995). However, the State Forest Service (formerly 'Servicio Forestal Venezolano', now 'Dirección General Sectorial del Recurso Forestal') is still under-staffed and poorly-equipped so that they can not properly fulfill this officially required task.

(5) Inadequate reinvestment in timber resources

No reforestation fund is prescribed in which concessionaires should have to pay a certain amount of their profits. The allocation of funds to accomplish the legal tasks in relation to timber stand improvement and reforestation are up to the concessionaires. Hence, commitments can be easily watered down by arguing about too high costs for tending (cf. Plonczak, 1989).

### *3.4. Encroachment on permanent forest estates*

In the 1970s, available land for the agrarian reform ran short. In 1973, 575.000 ha could be allocated to landless farmers while the figures declined to 280.000 ha for the whole period from 1974-1978 (figures refer to the overall area assigned to the agrarian reform) (Ade, 1992). As on the other hand the influx of landless farmers declined only slightly, PFEs were increasingly perceived as alternative areas for farming.

Land occupation is a two step process. In the first phase, farmers slash and burn a patch of logged-over forest for cropping. As the yield declines, smallholders sell their 'land improvement' to better-off farmers who convert the purchased land into pasture. The smallholders move to another area to start the cycle again (Rojas, 1993). The relocation of illegal farmers outside the PFEs has proved to be ineffective as the compensation payed has encouraged even more people to encroach. Heavily encroached areas were ceded to the colonization programme of the agrarian reform. But even this measure could not alleviate the pressure on the remaining forest (Delgado et al., 1986; Rojas, 1993). Due to the cessions, the PFEs have declined to about 25% of the original area (Centeno, 1995).

## **4. Discussion and conclusions**

At the expense of forest cover, many landless farmers could be provided with land titles. Until recent times, timber produced by conversion of natural forests into agricultural use, has accounted for up to 50% of the annual roundwood production in Venezuela. Thus, the states of the western plains and Zulia, as major regions for the colonization schemes of the agrarian reform (Fig. 4), have been the main supplier of such kind of timber (SEFORVEN, 1990, 1993). Interestingly, only the steady decline of forest areas set aside for conversion led to a sharp increase in the number of long-term logging leases in PFE (Centeno, 1995). Of the 3.5

Mio. ha presently managed under a concession system (Plonczak, 1997), only 200.000 ha are found in the study area. Under the current management practises and legal framework, it is unlikely that concession logging is capable of providing a sustainable supply of timber.

Is the replacement of forests by agriculture a sustainable alternative? Landholdings in Cojedes and Portuguesa established in the early days of the agrarian reform having a diversified production seem to be economically viable (Ade, 1992). Later colonization programmes suffered from the austerity policy of the Venezuelan government starting in the early 1980s. Thus, the upper part of the western plains shows a fairly modern and intensive agriculture while the lower part (Barinas and Apure), where the largest timber resources remain, lags behind this development (Rojas, 1993). However, the trend is towards extensification of agriculture due to the low food prices and the overall neglect of the agricultural sector (Ashoff, 1992). The stark and continuing disparity in land tenure (9% of the farmers own 87% of the land; OCEI, 1998) and the missing processing of agricultural products in the region (Ade, 1992), which could create employment outside agriculture, are other major factors responsible for the ongoing encroachment on PFEs.

The lesson learnt from recent land-use history in the western plains is that channelling rapid population growth by migration to forested regions without offering a lasting institutional and financial framework capable of establishing and preserving sustainable land-use systems and without tackling the politically difficult problem of land reform, provide only a short-term relief from demographic pressure (cf. Repetto and Gillis, 1988). In the long run, an ineffective, short-sighted land-use policy results in the degradation of renewable resources and in an even more pronounced social disparity, leading to political instability. Intensification of agriculture is a prerequisite to slowing down deforestation (Southgate, 1998), although its efficiency is limited due to the prevailing natural conditions in the study area (cf. Beyer-Müntzel, 1983). Other major objectives for overcoming the current problems are the decentralization of land-use planning and resource taxation and a land reform which deserves its name. However 'there is no such thing as sustainable development for an infinite number of people' (Fearnside, 1997). Hence, apart from defining the limits of carrying capacity, there must be a family planning programme to stabilize population size in the meanwhile.

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Figure 1. Natural regions of Venezuela

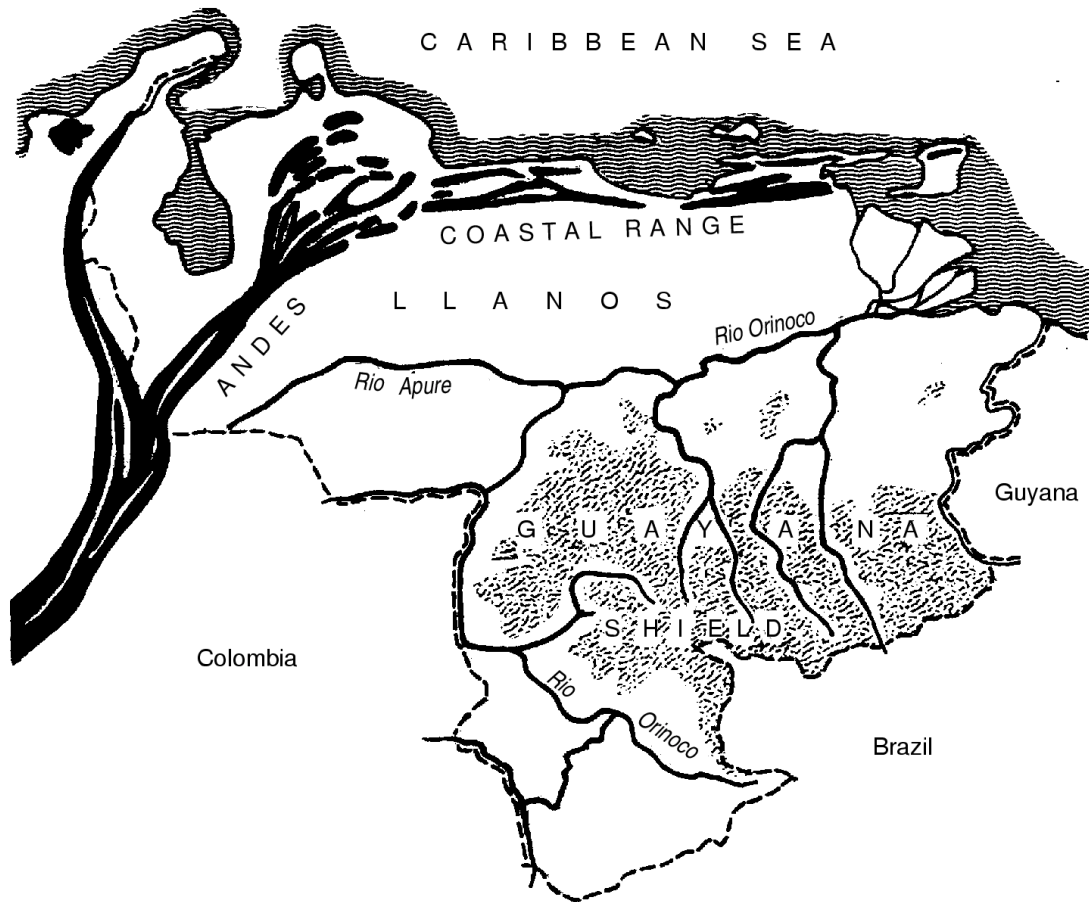




Figure 2. Vegetation types in the western Venezuelan plains

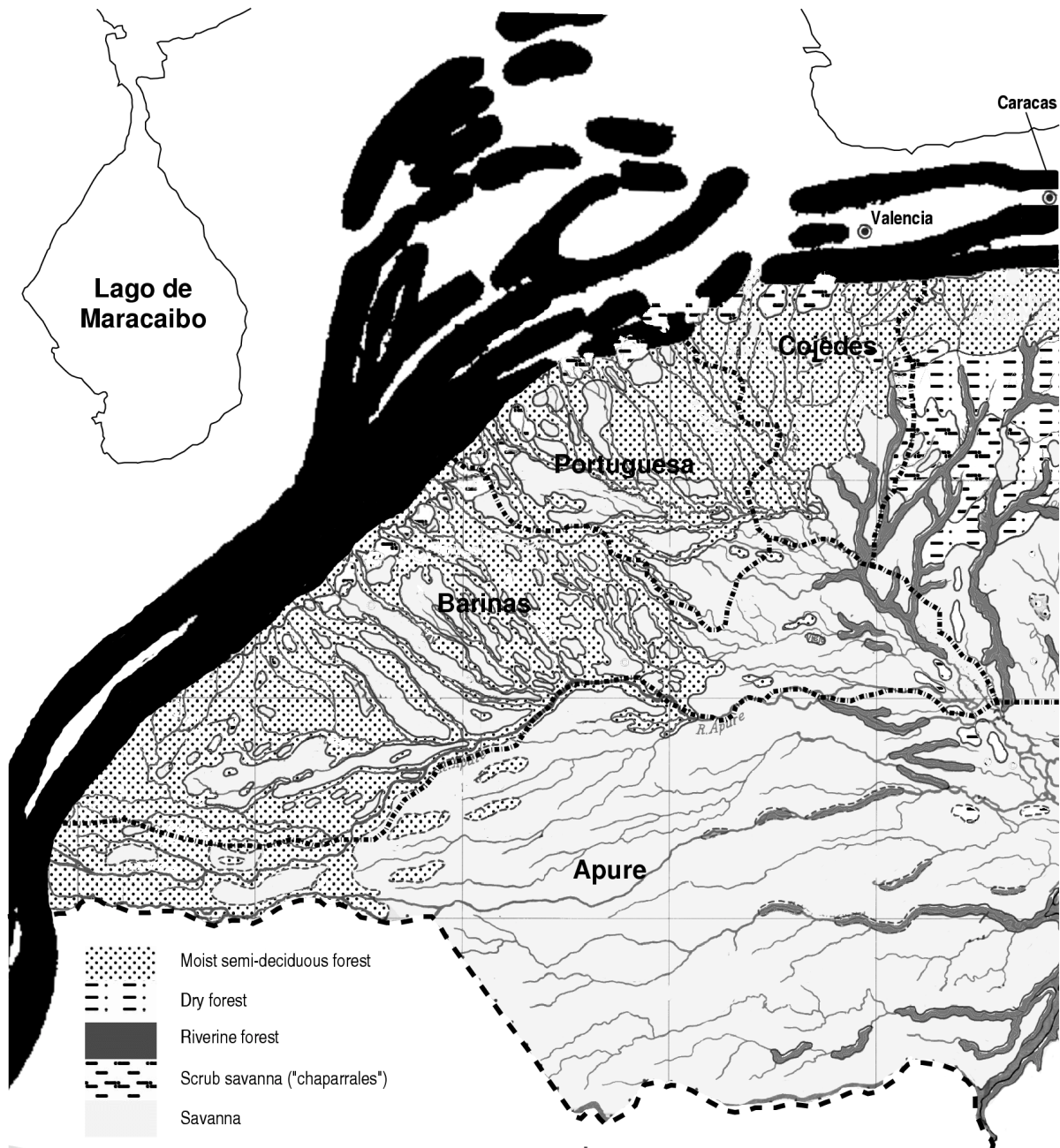


Figure 3. Permanent forest estates and federal states in Venezuela

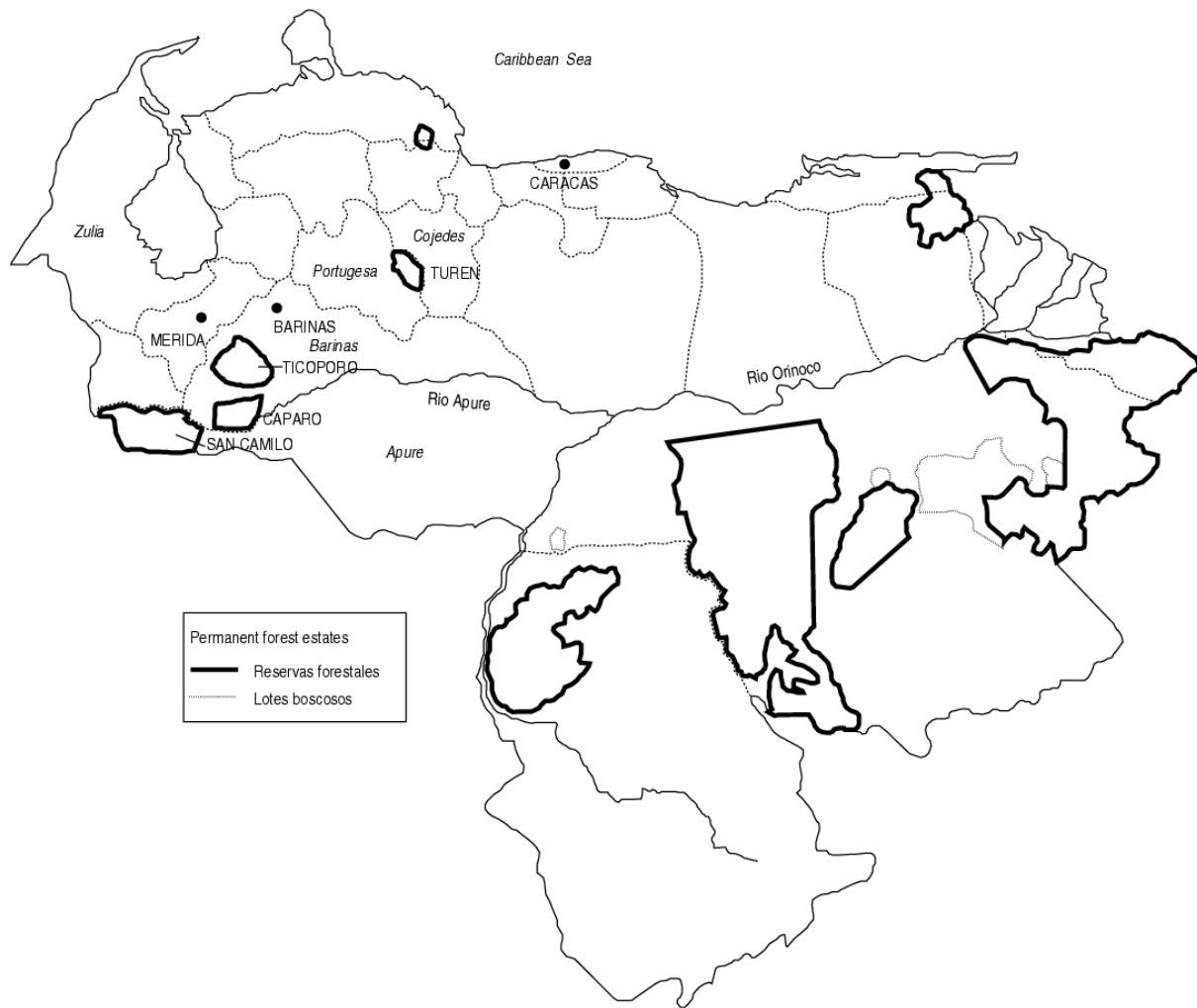


Figure 4. Public land assigned to the agrarian reform of 1960 (from Ade, 1992).

