The Ecology of Swidden Agriculture and Agrarian History in São Tomé.
Monsieur Pablo B. Eyzaguirre

Résumé
P. B. Eyzaguirre — Écologie de l'essartage et histoire agricole de São Tomé.
L'agriculture sur brûlis est le secteur qui se développe le plus vite dans l'économie vivrière de São Tome, cette île ouest-africaine exportatrice de cacao. São Tome est une société de plantation caractérisée par un pluralisme socio-culturel où le statut est déterminé par l'ancienneté d'installation et la propriété de lopins (glebas). L'essartage est devenu le principal domaine de développement agricole et commercial dans une île où plus de 90 % des terres appartiennent à de grandes plantations, aujourd'hui nationalisées (roças), tandis que 6 % (les glebas) sont affectés de contraintes sociales qui restreignent leur amélioration. Le passage au système écologique actuel de culture sur brûlis est une réponse aux transformations politiques et à la demande croissante de produits vivriers.
L'histoire agro-écologique de São Tomé au cours des cent dernières années contredit les théories qui associent l'essartage à un faible niveau de commercialisation et à des groupes sociaux peu complexes. L'exemple de São Tomé attire l'attention sur l'importance de l'essartage pour les entreprises agricoles et suggère que ce phénomène, souvent négligé dans les plans de développement, est également présent dans d'autres sociétés agraires complexes d'Afrique.

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Pablo B. Eyzaguirre

The Ecology of Swidden Agriculture and Agrarian History in São Tomé*

In the Democratic Republic of São Tomé e Príncipe, a lusophone African country in the gulf of Guinea, swidden agriculture is the fastest growing sector within the food-producing economy of this cocoa-exporting island. This fact, and the historical circumstances which produced it, challenge several common assumptions about the role of swidden agriculture in the evolution of regional farming systems. The case of swidden farming in São Tomé demonstrates the importance of social and political factors in the development of farming systems and specific agro-ecologies. Only explanations based on an historical understanding of political as well as ecological change can adequately account for this recent expansion of swidden farms. Based on a field survey of sixty farms in 1981-82, this paper describes the origin and development of swidden agriculture in São Tomé and the implications of this type of farming for ecological theory and development projects in Africa.

Swidden Agriculture and Evolutionary Sequences

Swidden agriculture is a form of shifting agriculture in which the forest is cleared and burned prior to the rains. The resulting clearing, or swidden, is planted with a number of crops with varying degrees of polyculture. Soil fertility is restored through the natural regeneration of secondary forest, or capoeira (Clarke 1976; Grandstaff 1981; Grigg 1974: 57-74). The techniques are simple, requiring few tools, a machete and a hoe, and no chemical or animal fertilizers. The major investment is labor to clear

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the plot, and when pests and weeds become a problem, the swidden is abandoned. After the first-year crop, it is left increasingly untended. In the second and third years, root crops predominate. Afterwards, the swidden is used for fruit trees and plants, and condiments which are protected or planted as the plot is allowed to regenerate into forest. Regeneration varies with the type of clearing, planting, and edaphic and climatic conditions, although a minimum of ten years is normal for the beginnings of secondary forest in São Tomé. Fallows and regenerating swiddens are an important but as yet poorly measured component of the economy of these cultivators (Clarke 1976).

Because of its simple technology, swidden agriculture is most frequently associated with subsistence production and with unmonetized, relatively unstratified societies of the humid tropics, such as the Amazonian Indians (Beckerman 1983; Hames 1983). Evolutionary approaches to agricultural ecology and farming systems associates swidden farming with communal ownership of land and little or no commercialization of produce (Grigg 1974: 58). Furthermore, this evolutionary sequence posits a shift from swidden agriculture to a more intensive farming system resulting from the breakdown of communal ownership of land, the increased demand for food crops by growing populations and urban areas, and the spread of cash crops (ibid.: 69; Manshard 1974: 35, 53, 55). While such approaches correlate swidden farming with simple societies, the Food and Agriculture Organization (FAO) in 1957 considered shifting agriculture in general to be technologically backward and a major threat to tropical zones. However, despite commercialization and technological diffusion since 1957, swidden agriculture has expanded in scope, particularly in Africa (Grandstaff 1981: 28).

Evolutionary and technological models have been unable to account for this expansion and commercialization of swidden agriculture because they obscure an important distinction between two types of swidden farming systems. The first, and better-known type, is the integral system of shifting agriculture which is associated with the traditional subsistence economies of self-contained communities. The second type is a partial system of shifting agriculture which reflects the economic interests of its individual participants and is associated with cash crops and squatter agriculture (Conklin 1957: 2). While the technology of the two systems is similar, their social contexts are significantly different. These differences are reflected in the overall decline of integral subsistence shifting agriculture, and in the expansion of the more commercialized partial system. Despite its expansion, few studies have focused on this second type.

While not directly addressing the typology, studies in Africa show that growing numbers of farmers have adopted swidden agriculture in response to the rising demand for cash crops and to satisfy the internal market demand for food (Hill 1970; Berry 1975; Bortei-Doku 1981). These
findings contradict evolutionary sequences that associate swidden farming with subsistence economies, low levels of commercialization, and self-contained social groups.

Recent data from the island of São Tomé appear to confirm these findings and provide an ecological and historical sequence in which swidden agriculture follows more intensive farming systems within a single region and environmental zone. Analysis of São Tomé's commercial farming may also help to explain the expansion of commercial swidden agriculture in other areas of Africa and correct underlying assumptions concerning agricultural development sequences and policies (Harwood 1979: 18-19).

Commercial Swidden Farming on São Tomé

The island of São Tomé, with a total area of 857 km², lies just north of the Equator in the gulf of Guinea. Approximately 37,000 ha are under cultivation: 21,000 with cocoa, 13,500 with coffee, oil palm and coconut, and some 2,500 with annual food crops. Swiddens occupy roughly 1,100 ha, or 3% of the total area under cultivation. Yet, this small area accounts for nearly 40% of the total surface planted with annual food crops. Moreover, market surveys suggest that during the rainy seasons (October-December, and February-June) the swiddens produce the bulk of the vegetables and tubers sold on the urban market.

Most swidden farms are found in mountainous areas above elevations of 600 m, where secondary rainforest predominates and annual rainfall ranges from 3,000 to 4,000 mm. Despite heavy rains, steep slopes and numerous streams and rivers, the large forests and permanent crops make this area fairly resistant to erosion. In addition, the soils of this volcanic island are of basaltic origin and are thus relatively deep, permeable, and resistant to erosion, as well as highly suitable for cocoa, São Tomé's principal export for the last century.

In the first year of the swidden cycle, São Toméan farms produce cabbage greens (couve), tubers, such as taro (Xanthosoma sagitifolium), sweet potatoes, manioc, beans, maize, and plantain for sale at the market of the capital city, São Tomé. Older swiddens also produce a great variety of tree and field crops (e.g. guava, avocado, banana), tubers and condiments (e.g. hot peppers) of lesser economic importance. Since land is abundant, after the first few years of planting, a plot may be left fallow for as long as thirty years before it is cleared again. However,

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1. Swiddens cleared within five years of the survey were considered to be under cultivation although planting normally occurs only during the first two years. The transition from field to fallow is gradual, three- to five-year-old swiddens still producing important quantities of tubers, condiments and tree crops, and attracting game.
for fields close to roads and houses, the fallow period is much shorter (five to six years); permanent grass fields tend to form and the soil becomes less fertile and more difficult to work.

The zone discussed here (Map 1, dotted area) contains the largest concentration of swidden farms on the island. Over half the independent farmers in this region were interviewed in a survey of sixty swidden farms. The survey revealed several features which distinguish São Tomean swidden farming from swidden agriculture in socially less complex regions.

Firstly, swidden farms in São Tomé are highly commercialized, producing mostly for sale rather than consumption. All of the farmers surveyed market 55-60% of the produce of their first- and second-year swiddens. The remaining 40-45% of the produce is consumed by the farm family or exchanged within the wider network of kin. After the second year, the protected crops that remain (e.g. tubers, bananas, condiments) are used primarily for consumption. Nevertheless, some of these crops are marketed as well, depending on the farmer's personal inclination, or the household's motivation to gather and transport the crops for sale. The independent farmers are all male and they control crops from the first- and second-year swiddens. Women and other family members have greater rights to dispose of the products independently after the second year's harvest. The decision to sell the produce of older swiddens varies greatly from farm to farm and year to year, especially since almost all the produce must be sold at the capital city's market, a distance of 15 km over mountainous footpaths and roads.

Secondly, very few of São Tomé's swidden farmers live in close proximity to the plots they tend. According to the survey, about 45% of the farmers live in densely settled districts located 6 to 12 km from their farms. Another 45% live in even more distant regions of the country (e.g. the capital city) as much as 17 km away. Only 10% have homesteads in the forest region where their swiddens are located.

Thirdly, many swidden farmers in São Tomé were employed as salaried workers prior to becoming farmers. All the farmers included in the survey had previously been salaried or artisans for periods greater than five years. Most had worked for the plantations (roças), but some had been musicians, mechanics, and laborers.

Fourthly, swidden farmers come from diverse social categories within the socially and ethnically plural society of São Tomé. None of these

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2. Swidden farming in this area of approximately 1,100 ha is undertaken by both independent farmers, who derive at least half their income from their swiddens and forest products, and by plantation laborers. The latter category are economically significant in the national agrarian economy but were not the focus of this survey as they are primarily wage laborers.
categories can claim a tradition of swidden agriculture, nor is there a clear association between this agro-ecology and a sociocultural category. Nonetheless, the choice of crops planted and the degree of intercropping varies with the social and cultural background of individual farmers.

Map 1. Pre-independence roça boundaries, smallholders and shifting cultivation. (Source: Tenreiro 1961a: 181.)
For most of them, swidden cultivation has been a skill acquired in response to the economic and political conditions since independence.

As the preceding four points indicate, farmers generally view swidden agriculture as a commercial venture. The cash income derived from the sale of crops was the reason most frequently given for establishing farms in the *capoeira* or secondary forest. Others wanted to ‘avoid trouble’ in the towns and to be independent, while two respondents cited the need to feed their families as their principal motivation.

Because São Tomé e Príncipe suffers a chronic shortage of hard currency due to depressed cocoa prices and declining production of export crops, the country is obliged to rely on locally-grown food instead of importing over 90% of its food as had been the practice under the Portuguese. The increasing demand for vegetables, taro, and maize, by a population that is growing at 2.9% a year, has made commercial swidden farming very profitable. While the present economic conditions make food farming a lucrative venture, they do not necessarily explain why swidden agriculture has become the particular agro-ecological response to this market demand. An explanation must include historical, social and political factors, as well as environmental and ecological factors.

Social and Ecological History

São Tomé was most likely uninhabited at the time of Portuguese discovery between 1472-1486, and was covered by a dense tropical rainforest which São Tomeans call *obó*. It was populated in successive economic and political phases. Persons brought to the island during these phases formed distinct categories in the society (Tenreiro 1961a; Pélissier 1979: 211-228). The following discussion identifies these social categories and the historical context of social, political and ecological change that accounts for the present rise of commercial swidden farming in a complex plural society (Smith 1975).

The first environmental changes occurred in the late 15th and early 16th centuries with the establishment of sugar plantations by the Portuguese. Among the early settlers were Portuguese Jews, convicts, sugar planters and merchants, Africans from the Benin coast, the Congo and northern Angola. First brought to São Tomé as slaves to work on sugar estates, the African population became free through a series of royal decrees and generational assimilation, thus creating a large free black sector. New slaves were continuously imported to work the sugar plantations and for re-export. Free Blacks, the most numerous racial group in the free population, were known as Forros.

The sugar plantation ecology drastically altered the island’s environment by massive deforestation to create sugar fields in the lower elevations and along the numerous rivers, and to provide fuel for the sugar mills.
The mountain region remained a forest refuge for runaway slaves and independent African farmers. The main crops were yams, taro (*Colocassia*), and *izakente* breadfruit (*Treculia africana*). New-World crops such as maize, taro (*Xanthosoma*), and manioc were introduced during the 16th century along with bananas and sweet potatoes.

The sugar plantations were short-lived as White and Mulatto planters fled the island's political turmoil to the calmer, more extensive cane fields of Brazil. Africans on the island progressively won their freedom and some became powerful slave traders and slave owners in their own right. Population was concentrated in the lowlands abandoned by the sugar estates. Trade in slaves and foodstuffs was the economic base of the island and, from the mid-17th to the mid-19th century, was controlled by the Forro elite, known as *filhos da terra*. The Portuguese presence was sporadic and subject to the *de facto* authority of the ruling *filhos da terra*.

With the decline of the sugar plantations, the secondary forest regenerated completely in much of the areas above 400 m (Tenreiro 1961b). New-World food crops, particularly manioc and taro (*Xanthosoma*) became extremely important in the agriculture of São Tomé and, along with plantain and banana, they soon supplanted local African crops. The forest zone remained inhabited by bands of runaway slaves who descended periodically to raid the Forros in the lowlands for food and women.

With the loss of Brazil in the 19th century, Portugal began the *mise en valeur* of its African territories in São Tomé e Príncipe and Angola (Clarence-Smith 1985). An 1844 report to the Crown on the state of São Tomé noted that there were only forty-seven residing Whites and Mulattos. The remaining population of over 8,000 persons were Africans, of whom roughly 25% were slaves (Lima 1844). Most of the land below 400 m belonged to religious and State corporations run by the *filhos da terra* who parcelled out small sections called *glebas* to their families and clients. *Filhos da terra* also owned vast estates in their own right. At higher elevations, Forro smallholders were in possession of smaller parcels in regions where legal title was irrelevant given the surplus land.

During the 18th and early 19th centuries the typical ecology of both lowland and highland regions was one of tree and root crops grown in dense mixed stands with minimal tillage. The economy was based on subsistence food crops, with *filhos da terra* controlling the surplus for supplying the slave trade and their followers. In 1800, Brazilian traders introduced coffee which Forro planters sold to the ships calling at the island to take on water and food. Surplus food crops and palm oil were the main exports: the former to feed the illegal slave trade, and the latter to be manufactured into soap for the intra-gulf trade. In the region above 600 m, the Maroons had been pacified and native Forro planters
began growing coffee with good results and their holdings increased in number and size.

From 1858-1878, the Portuguese reimposed their authority and control over the island and its economy. They abolished slavery, thus impoverishing many elite filhos da terra. Most importantly, the Portuguese established large plantations known as roças to grow cocoa and coffee for export. By 1900, these estates claimed over 90% of the island, and the Forros were marginalized and left with microholdings (i.e. glebas). Though marginalized, Forros remained enfranchised citizens and refused to work on the roças, which relied exclusively on contract labor from Angola and Mozambique after 1900. These contract laborers were known as serviçais and their descendants born on the roças are known as Tongas. Anxious to avoid association with the roças, Forros maintained
a strict social distance from both Tongas and serviçais, which was welcomed by the roças given their management’s fear that Forros would infect the contract laborers with notions of independence.

Ecologically, the roça was expanding from 1878 to 1910 when it reached a peak (see Map 2, and Fig. 2, p. 124). In 1906, the roças had approximately 70,000 ha under cultivation. With ample supplies of contract labor under conditions that differed little from slavery, roças extended cultivation up to elevations of 1,100 m, with high-altitude export crops such as arabica coffee, quinine, and cinnamon (Fig. 1). Barracks and estate houses dotted the area which had been dense forest prior to 1858.

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The agricultural ecology in this zone was based on the monocropping of export tree crops employing a large labor force that was fed with imported food. The year 1910 marked the apogee of the roça in ecological, economic, and political terms. In that year, São Tomé was the world’s leading cocoa producer, the typical roça ecology of monocropping extended over the majority of the island’s 86,000 ha, and the estates were run like independent fiefdoms. Roças issued their own currencies and
administered their own brutal justice to the serviços. All agriculture not directly managed by the administration was prohibited in their vast domains and land reserves.

Although the plantation complex was impressive, it was already outdated, costly and uneconomic after 1910 (Pélissier 1979: 215-228). The average cocoa yields on the roças during the 1940s and through 1963 ranged between 250-350 kg/ha (Silva 1958: 208-213). These yields did not compare favorably with those of West African small farmers who on the average obtained similar or better yields with significantly lower investments of labor and capital (Hammond 1962; Hill 1970; Kotey, Okali & Rourke 1974; Berry 1975).

Between 1910 and 1935, the roças economic decline led to the gradual abandonment of plantation areas above 800 m. The forest regeneration was interrupted around 1935 however, when the world economic crisis reduced the value of exports. Roças were thus encouraged to become self-sufficient in food until the end of World War II. Roças at higher elevations cleared fields for the intensive cultivation of annuals, potatoes, maize, cabbages, beans and carrots. The agro-ecology was characterized by intensive farming of annuals with contract labor, fertilizers, animal traction, and irrigation. There was little or no intercropping. Unlike the earlier system of plantation-tree crops, all parcels of level land in the zone under study were completely cleared of trees.

The post-war cocoa boom reduced the need for food production and the area was allowed to revert to forest. Although the roça system was decaying, the Portuguese continued to rely on it as a political instrument of their colonial rule. In 1954, the first three swidden farms were cleared by Forros escaping the bloody repression of a native rebellion against corvée labor in 1953 (Pélissier 1969: 229-240). These Forros entered the forest in search of refuge and farmed with the tacit consent of roças that no longer had the resources to administer and exploit their vast land reserves. This core group still provides leadership to other farmers in the region. However, no other independent farms were established prior to 1960.

Political pressure from the international community, the national liberation movements in Portuguese Africa, and the democratic movement within Portugal itself produced a series of political reforms in the African territories from 1960 through the 1974 decolonization. These measures which enabled Tongas, serviços, and Cape Verdeans to settle in São Tomé and work outside the roças had an immediate effect on land use and ecology in the region. Few Tongas had land and those working independently in agriculture established swidden farms in the capoeira.
Analysis

Of the 60 swidden farms surveyed, 20 were established prior to independence in 1975 and 40 were established after. Of the pre-independence farms, 70% were cleared between 1960 and 1975 by former plantation laborers. Most of these persons (59%) were Tongas and 24% were Cape Verdeans. The remaining 17% were Forros.

As the Portuguese roças held 93% of the land and the Forro glebas occupied 6%, ex-plantation laborers seeking economic opportunity in agriculture became squatters in abandoned plantation lands. After 1963, it became more difficult for roças to displace squatters, so they tacitly recognized their existence through informal payments of rents in cash or agricultural produce. With ill-defined rights to land tenure, squatters were unwilling to make investments to intensify production per unit of land. Furthermore, this early group was relatively impoverished and had no means to afford capital inputs. Squatting thus promoted the current system of swidden farming that requires little or no investment in land other than labor.

The political decline of Portuguese power and the roças entailed a weakening of the roças' power to confine laborers and their descendants to the estate, and to exclude Africans from their vast unexploited reserves. This political precondition enabled enterprising Africans to exploit the capoeira zone. In addition, the still uncertain political and legal status of the early farmers also conditioned the adoption of a swidden ecology. Thus, changes in the island's political structure help to explain the change in the region's agro-ecology from intensive field farming to swidden agriculture (Fig. 2).

Since independence, swiddens continue to characterize the agricultural ecology of the region. However, there has been a clear change in the social and ethnic composition of the farmers entering the capoeira. Tongas only accounted for 17% of the post-independence farms surveyed, while Cape Verdeans and Forros were 35% and 48% respectively. Currently, there is no ethnic social category associated with this particular type of farm enterprise. This coincides with the dissolution of the colonial system and the differential incorporation of persons according to race and ethnic origin under the Portuguese.

3. The survey conducted included 100% (20 units) of the farms established prior to 1975. The rapid rate of increase and dispersed location of swiddens since independence made it difficult to ascertain with exactitude what percentage of the post-1975 total is represented in the 40 farms surveyed. Experienced farmers in the region estimate that 100 to 120 independent farmers have entered the region since that date, in addition to numerous laborers on the State plantations who also cultivate swiddens.

4. Cape Verdeans were the principal source of plantation labor in São Tomé after 1960 (Rodrigues 1974; Carreira 1982).
Growing numbers of Forros have become swidden farmers. Most Forros farming as squatters in forest also have access to land on their glebas. The choice to exploit forest swiddens as squatters rather than intensify cultivation on the glebas is primarily due to four factors. First, the social, cultural and political entailments associated with gleba tenure constrain the intensification of economic uses of the land by a single member or section of a Forro family. Historically, glebas served to define Forro identity and free status in opposition to the plantation sector. In order to manage land primarily as an economic resource, Forros choose to invest their labor in swidden farming. A second related factor concerns the particular ecology associated with glebas, which has been described as arboreal consociations with several storeys of tree crops, plantains, shrubs, taro and manioc (Rodrigues 1974). Altering this ecology in order to produce more income from the land would call into question the identity and solidarity of the Forros claiming rights to the glebas. Ecology is in this case a feature of social identity which overrides pressures to intensify the productivity of these parcels. Thirdly, the political conditions since independence, the nationalization of the roças, and the more lenient policies towards land use have enabled more farmers to exploit the secondary-forest reserves of the estates. The fourth factor is economic: glebas which traditionally produce cocoa and food crops have been greatly affected by the decline in world cocoa prices and those

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5. Over 90% of the approximately 10,500 glebas are under 1 ha and are perhaps too small to intensify. Interestingly, the Forros who farm in the forest had rights to relatively large parcels (Portugal 1968).
set by the State. Meanwhile, population growth and urbanization have increased demand for food crops, while the country’s shortage of foreign exchange has resulted in greater reliance on native foodstuffs. Thus, taro, couve (Brassica sp.), manioc, banana, which were subsistence crops, have also become important cash crops.

For Tongas and Cape Verdeans with weaker social and political ties to the ruling Forro majority, swidden farming represents an opportunity to acquire significant amounts of cash income, which is then reinvested in a network of kin that may serve to integrate them more fully into the national society. However, the current shortage of possibilities for investing surplus farm income outside of agriculture, along with a shortage of consumer goods, acts to limit economic expansion by the more industrious and efficient swidden farmers.

Nevertheless, swidden ecology is still expanding. Neither environmental, nor demographic limits exist at present densities of swidden farming. However, social and political factors could restrain this area of economic expansion, due to the lack of investment outlets for the surplus income, or the threat posed to existing socio-economic and political structures by agricultural entrepreneurs who have sought opportunity outside those same structures.

In the zone of São Tomé where swidden farming predominates, the agro-ecological sequence over the last hundred years contradicts evolutionary models of agricultural development. This zone was exploited first under a plantation system producing export tree crops, then under intensive field cultivation of annuals, and is now cultivated by independent small farmers in a swidden ecology. Forest regeneration has been cyclical and, given its steady and rapid rate, there is no evidence that present or past ecologies have permanently degraded the area’s environment on a large scale. Evolutionary models that associate swidden agriculture with subsistence economies cannot account for the São Tomé case where swidden agriculture represents commercial entrepreneurship in an agrarian economy where land use is constrained by social and political factors.

Changes in the agricultural ecology of this zone coincide with changes in the political and social structures of São Tomé. The political and social entailments of access to and control of land were the principal factors that conditioned the development of the various farming systems on the island. Only by considering the historical, social and political factors can one explain the particular agro-ecological sequence in a complex plural society like São Tomé.

In conclusion, models of small farm development that consider environmental and economic factors as principal determinants of particular agro-ecologies normally associate swidden agriculture with subsistence
and low levels of commercialization (Harwood 1979). They ignore the role of swidden ecology in agricultural expansion and commercial farming. Such development approaches overlook an increasingly important area of agricultural entrepreneurship, particularly in African societies where colonialism, social and cultural pluralism have produced non-economic values to land holding and land use. The case of São Tomé may thus help to focus attention on the ways in which African farmers in these social situations develop ecologies in response to restricted economic opportunities.

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