

African Savannas Global NARRATIVES & LOCAL KNOWLEDGE OF ENVIRONMENTAL CHANGE

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The Wild Vegetation Cover of Western Burkina Faso Colonial Policy & Post-Colonial Development

MAHIR ŞAUL, JEAN-MARIE OUADBA & Ouetian Bognounou

This chapter presents an overview of the evolution of the wild vegetation cover in western Burkina Faso from the early colonial period to the present day, highlighting the effect on vegetation of government policies and of recent agricultural practices.¹ Commercial development since 1960 has had a massive impact on the flora. To provide a reference point for this transformation and explore its sources we start our analysis at the beginning of the colonial era. We then describe a number of projects and larger-scale commercial ventures that have left their mark on the countryside. In Burkina Faso agricultural change is still strongly connected to smallholder farming. We therefore investigate the popular appeal of new forms of production such as tree plantations and their effect on wild plants. The example of western Burkina is instructive in the light of recent challenges to the widespread belief in a straight and narrow path leading to increasing deforestation in the West African savanna. Our survey confirms the contradictory and inconclusive character of human/environment relations, and the unforeseeable twists and turns which mark their development. We describe how recent commercial expansion leads in directions that are unexpected on the basis of a narrow demographical approach, and unlike what is reported for other places in West Africa. We suspect, however, that what we observe in Burkina is not unique.

The Ecological Setting

Our project area lies in the southern half of western Burkina Faso and is

Project members Jean-Baptiste Kiéthega and Christophe Dya Sanou, both of the University of Ouagadougou, have contributed substantially to our research and to the information provided in this chapter. Kiéthega has presented the results of his many years of research in extensive form in his monumental doctoral thesis, *La métallurgie lourde du fer au Burkina Faso*, 2 vols., Université de Paris 1, 1996. Sanou is continuing his erosion experiments in the Péni station and will present his findings separately in the form of articles and a doctoral thesis in preparation.



spontaneously a Sudanian orchard savanna conditioned by fire.² Average yearly rainfall ranges from 1100 to 1000 mm in a summer rainy season of 180 to 200 days. Predominant in the flora are the species *Burkea africana* Hook., *Detarium microcarpum* Guill. and Perr., *Trichlia emetica* Vahl., *Hymenocardia acida* Tul., *Ostryoderris stuhl-mannii* (Taub.) Dunn ex. Harms, and *Pteleopsis* subrosea Engl. and Diels (Group 2 of the Vegetation Map of Burkina Faso).³ The Tagouara plateau in the westernmost part of the project area, where two of our sites are located, is a highland over 700 m above sea level containing the headwaters of the Mouhoun (Black Volta), which flows north, and the Comoe, which flows south. East and south of the Banfora cliff the plateau drops to 500 or 400 m above sea level.

Fringing forests (*galeries forestières*) and thick dry forests are important components of the environment of the project area. The fringing forests are of unusual ecological importance. They are situated on the banks of streams or rivers that carry water throughout the year, and are delicate systems that can quickly go into irreversible decline. The rich flora that are characteristic of these forests, and the serious risks that farm clearings present to them, have long been understood.⁴ In some respects the fringing forests are like branches of Congo-Guinea vegetation that extend northward following the favorable environment of the river valleys, rather than a more luxurious version of the surrounding Sudanian vegetation. Of the 60 inventoried species of the Mouhoun fringing forests, 63 per cent belong to the Sudanian-Zambesian belt, 27 per cent to the Congo-Guinea belt, and 10 per cent are other species.⁵

The fringing forests are of greater ecological importance than would be expected from the small surface area that they occupy, because they contribute to plant diversity and protect the hydrographic system. The largest rivers of Burkina Faso and Côte d'Ivoire have their sources in our project area: the Mouhoun (Black Volta), Comoe, Leraba, and some tributaries of the Bani River, a major tributary of the Niger. The forests protect the banks of these rivers from erosion, maintain a humid microenvironment that reduces evaporation losses, improve water quality, and yield the most valuable timber trees.

The river valleys where these forests are to be found were not populated within our study period, as they were infested with the two disease vectors of this region, the tsetse fly, which transmits trypanosomiasis (sleeping sickness), and the simulium fly, which transmits onchocercosis (river blindness). In the 1970s and 1980s the

³ J. Fontès, A. Diallo, J.A.Compaoré, *Carte de la végétation naturelle et de l'occupation du sol, Burkina Faso*, Institut de la Carte Internationale de la Végétation, Université Paul Sabatier de Toulouse and Institut du Développement Rural, Université de Ouagadougou (Toulouse, 1994); J. Fontès and S. Guinko, *Carte de la végétation et de l'occupation du sol du Burkina Faso: Notice explicative* (Toulouse, 1995), p. 33.

⁴ L. Bégué, 'Contribution à l'étude de la végétation forestière de la Haute-Côte d'Ivoire', Bulletin du Comité d'Etudes Historiques et Scientifiques de l'Afrique Occidentale Française, Série B, no. 4 (1937).

⁵ E. G. Bonkoungou, 'Inventaire et analyse biogéographique de la flore des galéries forestières de la Volta Noire en Haute Volta', *Notes et Documents Voltaïques*, 15, 1–2, pp. 64–83.

² For the vegetation we use the terms 'wild' and 'spontaneous' as synonyms – the latter term being borrowed from the authors writing in French – to indicate plants that are not planted deliberately. Since the presence and distribution of these plants in the landscape are significantly affected by human activities, the commonly encountered expression 'natural vegetation' is not adequate for them.

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forests were systematically sprayed, in an international campaign to eradicate these diseases.⁶ They were also cut down or thinned, as part of the treatment, without serious consideration of the ecological consequences. However, the onchocercosis program did set up a monitoring procedure to ensure that the applications of insecticides did not seriously perturb the fresh water system. These zones, now declared free of disease, are coveted by organized bodies and private individuals. Among the organizations dedicated to settling them and opening them to agriculture, are the AVV (Aménagement des Vallées des Volta) and the Fronts Pionniers du Sud and du sud-Ouest, to which we shall return later.

The Colonial Period

The French colonial government shaped the successor nation-state in its baseline economic structure, but the effect was uneven when we consider specific domains. The direct colonial impact on changes in the vegetation cover was slight. Some extractive activities led to the transformation and impoverishment of the flora, but they were not of a magnitude and intensity to make a major difference. The same can be said of conservation efforts, which gained momentum in the later decades of the period. A more substantial impact on the flora was mediated by changes in farm life, which themselves were linked to administrative policies which set the rural areas on their course, but the more significant transformations came only after independence was won in 1960.

Persistent throughout the colonial and post-colonial periods combined and giving them coherence is the evolution of farm life towards greater commercialization. From the type of farming in which only surpluses were sold agriculture moved towards increasingly greater use of purchased inputs, including labor. The correlate of this sequence relevant to this chapter was the play between the expansion of areas under cultivation and fallow land management. After independence export-crop production and the extraordinary growth of grain farming for national and regional markets accelerated the pace of this dynamic. However, the wild trees were not replaced only with a few domesticated cultivars from annual grasses and leguminous species; instead, in our project area, agriculture turned towards fruit orchard 'agroforestry'. The following sections of this chapter are directed to a description and analysis of these developments, showing the range of variation in the different parts of our project area, and assessing the importance of local particularities. They conclude by showing how crucially fruit orchards are integrated into the farming pattern in the project area, and bringing out the implication for fallow land and wild vegetation.

Colonial research. The beginning of the twentieth century in what is now Western Burkina Faso was marked by the disruption of nearly three decades of uninterrupted war. The 1890s witnessed major confrontations between the forces of Sikasso, Samori, and the French, and an acceleration of smaller conflicts between villages plus heightened banditry. Even more destructive to the local economy were

 In Burkina Faso this action was carried out by the Service Général d'Hygiène et de Prophylaxie (SGHMP). the French colonial occupation and efforts to establish a colonial administration in the first decade of the twentieth century. The aggregate result of these events was loss of population and wealth, and a retrenchment of farmed areas. Political crisis dragged on into the second decade of the century. There were growing movements of insubordination in the southern and western parts of the *cercle* (administrative district) of Bobo-Dioulasso, and then the great anti-colonial war of 1915–16, which spilled into the central and northern parts of the same *cercle* and was suppressed with destruction of property and mortality of disastrous proportions.

As a result of these misfortunes, when the early colonial observers penned the records that constitute the horizon of our own research, they were witnessing an economy that had severely regressed in a relatively brief period of time. What they described in static terms or as an incremental development of farming was instead a landscape that was returning to a state of relative non-use, following a period of more intensive occupation only a few decades earlier. Under the coercive colonial peace that was imposed after World War I the population returned only slowly to its former level, and the rural economy started on its course of development as a colonial 'backwater'.

Compared with other colonial powers, France was late in conducting systematic surveys of natural resources and economic potential and in formulating a conservation policy. We do not find in French West Africa the environmental 'conservation lobby' of the British colonial establishment, nor the energetic coalition of local forces that opposed such conservation efforts.⁷ The late pre-colonial explorations of L. G. Binger and L.-P. Monteil, in 1888 and 1890 respectively, give some indications of the landscape, some vignettes of occasionally prosperous agricultural economies and busy trade life, but they are far from providing a coherent picture of the environment. The gathering of information by men of science starts with August Chevalier, a botanist who in 1898/99 was included as a researcher in the conquering columns.⁸ His mission was followed by that of Emile Perrot in 1927/8, and of Bégué in 1936.⁹ These missions, while few and far between, give us precise information on the natural vegetation, land use, farm production, plants and their uses, the constitution of a classified forest, and the mosaic of ethnic groups (a list of more than thirty) in what is now western Burkina Faso.

Colonial agronomic research started almost as soon as botanical exploration. Starting in 1901, the administrators introduced fruit trees such as mango (*Mangifera indica*), citrus and pineapple, and spread species that were not foreign, such as bananas and papayas, to areas where they were scarce or non-existent. These initiatives were carried out in an authoritarian manner. Villagers were ordered to plant and maintain fruit trees, especially in the roadside colonial compounds dotting the countryside for travelling officials to spend the night. The first agronomic research and experimentation station in what is now western Burkina Faso was

⁹ Bégué, 'Contribution'.

For the cases of the Gold Coast and Nigeria, which contrast sharply with colonial Upper Volta, see R. Grove and T. Falola, 'Chiefs, Boundaries, and Sacred Woodlands: Early Nationalism and the Defeat of Colonial Conservationism in the Gold Coast and Nigeria, 1870–1916', *African Economic History*, 24 (1996), pp. 1–23.

A. Chevalier, 'Mon exploration botanique du Soudan français', Bulletin du Muséum d'Histoire Naturelle, 5 (1900), pp. 248–53.

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established in 1904 in Banfora. By 1908 this station had a ten-hectare-wide plantation near the waterfalls of Karfiguela. Here attempts were made to create *Landolphia* (vine rubber) and *ceara* (*Manihot glaziovii*) plantations. Other programs of tree-planting in the villages were under the supervision of canton chiefs. Later, additional stations in Niangoloko and Farako-Ba were opened. These institutions assisted in the introduction of species such as Teck and Neem, and also the successful propagation of new fruit trees, which revolutionized farmer strategies in organizing production, a topic to which we shall return in the section on 'Mango and other fruit orchards'.

Colonial policy and development. The most important colonial policies to affect the environment fell under the notorious expression *mise-en-valeur*. This term can roughly be translated as development, but includes in its meaning the idea that resources were wasted in the hands of the local population, either for lack of investment or because the locals were indifferent to intensifying production. The ideal against which this failure was registered was not always spelled out clearly. Sometimes it meant the potential for a higher level of production, desirable both for the well-being of the population being administered and for greater government revenue. At other times foremost in the mind of the *mise-en-valeur* planners was sustaining the imports of the metropole. These different objectives intertwined, with the most prosperous colonies having the strongest export regimes, generating most local revenue from taxes on foreign trade.

Western Burkina Faso, under the various names it assumed in the different phases of its colonial existence, was both export-poor and poor in revenue. *Mise-envaleur* here therefore meant primarily the encouragement of export crops, and secondarily large public work projects. Furthermore, exports meant commodities that could be exported to France, restricting the list of development crops to peanuts, sesame, and cotton. The older export products of the region, most importantly cattle and iron tools to the forest region, and secondarily dyed cotton cloth, were only of interregional significance and were not encouraged. The production of these older commodities did come into conflict with major colonial policies, but they were simply ignored rather than being actively suppressed.

Other important aspects of colonial policy were the struggle to spread the use of minted currency at the expense of the generalized use of cowrie shells and supporting barter-like exchanges, and the sustained effort to increase direct taxation in the form of the head tax. Again these two were connected, and together determined how this region was integrated with the rest of the colonial economy. The development of the grain market to supply the growing cities, for example, cannot be understood without taking account of these two colonial policies. In the pre-colonial period there had been a large group of non-producers (warriors, Islamic clerics, traders), probably comparable in size to the urban population of the colonial period, but nevertheless grain markets were small compared with the active commerce in other commodities. The growth of food production for sale and the development of a network of grain traders were here typically colonial developments with important consequences for agriculture, and therefore for the environment. Monetary transformation and taxation underlay these developments.

The abuse of human resources in the colonial period amounted to a kind of

'mining'. It included, first, forced labor and various corvées, and then, in addition, coerced migration of workers to develop the forest region of Côte d'Ivoire and the inner delta of the Niger. An unintended consequence of these policies was a parallel stream of voluntary migration to the neighboring British colony of the Gold Coast, which further drained the work force.

The guiding thread for the rest of this section and the following one can be given here in a few sentences. All things considered, the colonial period forced the population into a regime of intensified production. Besides its disproportionate human costs, this intensification showed poor long-term returns. The total colonial effect on spontaneous plant cover and the other elements of the environment is difficult to determine with precision, but does not appear to have been drastic except for the near extinction of large wild animals, particularly mammals, the combined result of an increase in the available means of destruction.¹⁰ Specific policies and developments brought contradictory positive and negative effects.

In terms of public projects, the most salient undertaking of the colonial government was the establishment and maintenance of a road network. Initially, the primary purpose of this network was administrative and military rather than commercial. Today it appears quite humble. But observers have pointed out that it was quite lavish relative to the technology and capital resources made available for its construction, or in terms of the uses to which the roads were put.¹¹ Until almost the end of the colonial period the network was built and maintained exclusively with requisitioned manual labor. In the 1920s the decision was taken to join the region to the ports of Côte d'Ivoire, and the road network was further expanded. River transportation was gradually abandoned in favor of cars as these became available, thus increasing the commercial value of the roads. The roads were generally lined with trees. But the transportation policies had another impact on forest resources that was barely veiled by this cosmetic improvement. We shall proceed here in reverse chronological order following the order of magnitude of the impact.

The most capital-intensive transportation project of the colonial period was the Abidjan-Niger railroad. The railroad came to the Mouhoun region late; it reached Bobo-Dioulasso in 1934 and Ouagadougou only in the 1950s.¹² It was a project which absorbed tremendous amounts of labor and foreign capital, and completed the re-articulation of the commercial flows of the region southwards, while cutting off the bend of the Mouhoun from the Niger basin of which it had previously been a part. The steam engines consumed a large volume of fuel, which, in the absence

 Of the large mammals that disappeared only the elephants have made a comeback in Burkina Faso in recent decades, following the world-wide conservation efforts focusing on the banning of ivory.
 In 1930 the colony of Upper Volta had 2,192 kilometers of motor roads, about twice as long as in

the twice as large French Soudan, and more than four times the roads of Côte d'Ivoire which was roughly the same size. At that time there were only 71 cars and 222 trucks in the entire colony, while the French Soudan had almost five times as many cars and more than twice as many trucks. The comparison with Côte d'Ivoire is even more unfavorable. See R. Delavignette, *Afrique Occidentale Française* (Paris, 1931), pp. 211, 212. Forced labor for road construction contributed to repeated anti-colonial uprisings.

The project was never completed in its original design. Under the regime of Captain Thomas Sankara the tracks were extended as far as Kaya, with the ultimate aim of reaching the rich Tambao manganese deposits, which does not appear likely to be realized soon.

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of mineral coal deposits, had to be supplied in the form of wood cut along the railroad tracks.

The station at Péni, which is one of our research sites, had a particular place in supplying wood to the trains coming from the south. The engines needed extra fuel to climb the steep slope between Bérégadougou and Péni before reaching the plateau of Bobo-Dioulasso and there was a two kilometer radius of wood cutting around this station. In this zone the productivity of ligneous plants is estimated to be only 16 cubic meters per hectare, with a growth rate ranging from 0.6 to 1.66 cubic meters per hectare. Steam engine demand led to the creation of the first classified domains in western Burkina – the classified forest of Péni, covering 1,200 hectares, in 1942.

The consumption of wood fuel had already started with automobile roads. Before the introduction of diesel engines, there were trucks that burned charcoal or wood. Locally called *gazo* (gazogene lorries), they absorbed large quantities of wood. In addition, the Péni region supplied the city of Bobo-Dioulasso with fuel. The demand was strong because of companies such as CFAO, CFCI, and the military camp, which was one of the largest in French West Africa. The city was the hub of industrial development in the region, and most of it was driven by wood or wood derivatives. For a while there was also a sawmill in Banfora and selective extraction of timber woods.

It is simply too difficult to evaluate quantitatively how important these pressures on the local plant cover were, and how much of a change they represented compared with the previous situation, because the industrial use of firewood did not start with technologies made available in the colonial period. Pre-colonial production had already intensively used selected hardwoods as a source of energy, the primary users being the blacksmiths engaged in smelting operations. In the project area there were extremely important iron production and tool-making centers, and the region as a whole was an iron exporter until scrap metal of European origin made this line of commerce superfluous. The extraction of iron ore, conducted on a scale that was capable of transforming the composition of local flora very quickly, continued well into the colonial period. ¹³

Ironwork is the occupation of endogamous groups, but these groups do not constitute a culturally and socially homogeneous category throughout the region. Blacksmiths form small clusters that contrast with the agricultural population, but also with each other, ethnically as well as in their work techniques. The presence of blacksmith groups in certain areas and villages, but not in others, is the result of contingent historical factors. In the research area, major smelting sites existed near Sara in Bwa country, around Péni, and on the Tagouara plateau. In these places, and in others too, local blacksmiths still continue to fashion farming tools in their forges, and supply almost all the tools that the farmers need, including some replacement parts and repair work for the newly introduced ox-drawn plows. In contrast, smelting operations stopped around 1950, as the tools started to be made using imported or scrap metal. When the smelting industry was still alive, its impact on the flora was specific because charcoal was produced from a limited number of woods of high caloric value. The impressive mounds of slag left behind in old smelting sites give a rough measure of the huge quantities of charcoal used.¹⁴ The principal species used for smelting were *Prosopis africana* Guill. and Perr., *Burkea africana, Parinari polyandra* Benth., *Swartzia madagascariensis* Desv., and *Hymenocardia acida*, which grow mostly on valley bottoms, and *Afrormosia laxiflora* Harms, which is a tree of the escarpment woods with ironstone concretion outcrops.¹⁵ As iron ore is very common in this area, the location of iron-producing blacksmiths was probably more dependent on the availability of these trees and their rate of exhaustion than on any other factor. Today the high-caloric species sought after by smelters are still rare in the landscape. The end of smelting activity in mid-century lifted this particular pressure on these species, at the same time as it was replaced by colonial industrial and transportation needs and as the government stepped up its effort to classify forest domains.

Forest plantation efforts were virtually null in the colonial period. The classified forest action was limited to forbidding access to the local population, and to modest fire protection. Underlying this policy were arguments of the botanists that the orchard savanna was the product of human activity, and if left undisturbed it would revert in the long run to the assumed climax of dense dry forest.¹⁶ In the 1940s the fuel needs of the growing cities increased concern for conservation, and classified domains were created around urban centers expected to expand in the future. The archipelago of classified forests that can be observed on any tourist map today was achieved at the expense of the population of the immediate area. With each decree many villagers lost their farmland, and the conflict between the putative economic advantages at the national level of having classified domains and the local populations' loss of resources when they were excluded from these domains was rarely addressed, either in the colonial period or in the days of independence that followed.

Unplanted Tree Crops from Colonial Times to the Present

The harvesting of wood for fuel was not the only colonial interest in forest products. Even earlier, the harvesting of another forest commodity shaped the colonial economy. Before even completing the military occupation, French officials in the Volta region seem to have decided that the major export commodity of the new territories was going to be rubber obtained from the spontaneously growing vine *Landolphia heudelotii* A. DC. France imported all its rubber from foreign markets outside its control and the economic potential of this plant had already

¹⁵ J.-B. Kiéthega, 'La metallurgie lourde du fer au Burkina Faso', Doctorat d'Etat thesis, Université de Paris I, 1996. Elisée Coulibaly, 'Savoir et savoir-faire des anciens métallurgistes: Recherches préliminaires sur les procédés en sidérurgie directe dans le Bwamu (Burkina Faso-Mali)', doctoral thesis, Université de Paris I, 1997.

¹⁴ The furnace models are very different, but one firing of a modest furnace that produced 15 or 20 kg of iron necessitated at least 25 cu.m. of charcoal.

¹⁵ Coulibaly, 'Savoir et savoir faire', also lists Terminalia macreptera Guill. and Perr. and Cassia sieberiana, DC.

Empirical research does not always justify this assumption. In a study carried out on a zone fenced and protected from fire after long years of agricultural use (in Sapone, in the central Mose plain) Ouadba found that the vegetation evolved toward perennial grasses rather than trees. J.-M. Ouadba, 'Note sur les caractéristiques de la végétation ligneuse et herbacée d'une jachère protégée en zone soudanienne dégradée', in C. Floret and G. Serpantié (eds), La jachère en Afrique de l'Ouest (Paris: ORSTOM, 1993).

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been identified in eastern Senegal at the end of the nineteenth century. Rubber exports had started before the French occupation. The African leader Samori had this product gathered, and sold it to help finance his firearm purchases.¹⁷

The Landolphia vine was fairly abundant in the southern and western parts of the Mouhoun, and in the first years of the occupation, the latex was promoted as a means of paying the head tax in kind. From 1900 to 1901 tax payments in the form of latex in the *cercle* of Bobo-Dioulasso doubled, although the overall level of production was still very modest. Soon afterwards private traders started to complain that the administrative policy of accepting taxes in the form of rubber latex deprived them of a market. The collection of taxes in kind ended in 1908, but the payment of tax from the proceeds of rubber sales continued. The gathering of rubber fitted the production schedules and internal division of labor of households. The latex was gathered by dependent young men and women in the non-farming season, relieving the heads of household from having to make substantial changes in their farms to pay the taxes, allowing them to make the junior members contribute without having to give them more autonomy.

The harvesting of rubber from wild vines proved disastrous for the species.¹⁸ After exceeding 22 tons in 1903 and reaching 29 tons in 1904, rubber sales stagnated and soon began to fall.¹⁹ The growth of rubber production then stagnated and soon began to fall. The damage done to the vines when they were incised frequently killed them, and the spontaneous stock rapidly started to disappear. In addition, in some places the population started to destroy the vines deliberately. They realized that the head tax had become a permanent imposition, demanding increasingly more hours of work to pay rising taxes, and they reasoned that without the *Landolphia heudelotii* vines most people could not be made to pay very much.

In 1910 rubber production went into full crisis because of the combination of falling local production and deteriorating world prices, as rubber from *hevea* plantations in other parts of the tropics entered the market. Between 1910 and 1913 the harvesting of rubber was officially prohibited in order to allow the natural stock to recuperate. In 1914 harvesting was permitted again and production reached a ceiling of 80 tons in 1920. The administration tried to establish *Landolphia* and imported *ceara* plantations to promote a different production strategy. However, the *ceara* did not do well and the artificial stands of *Landolphia*, while not totally unsuccessful, did not prove to be commercially viable. Eventually the gathering of rubber went down to nothing because merchants lost interest in it, although it picked up briefly during World War II, disappearing again after the war.

A few other forest products became export commodities in the colonial period. The most important was *shea* 'butter', known in the francophone world as *karité*, an oil which is in solid state at normal temperatures. It is obtained from the kernels of the tree Butyrospermum paradoxum (Gaertn. f., synonym: Vitellaria paradoxa) Hepper, of which there are vast stands in western Burkina.²⁰ This oil is the principal fat in the local diet and also has very important cosmetic and medicinal uses. Since precolonial times some of it entered local market exchanges. In the early colonial period, shea oil, while highly visible in the cercle statistics, was not regulated by government or targeted for development. In the 1920s production estimates varied between 100 and 200 tons per year. But shea oil found uses in the European chocolate, cosmetic, and soap industries, and became a significant export commodity after 1924. In the early 1970s shea oil and kernels together rose to become the third foreign-exchange earner for the country, although their share has been going down ever since.

The other important tree product is the African locust bean, which like shea nuts are gathered from unplanted trees (Parkia biglobosa Benth. and Hook). These seeds are processed into a condiment (sumbala, a kind of strong vegetable cheese) and constitute one of the highest value-per-weight commodities of the rural economy. The pods provide another important food product, the yellow sweet powder that is sold in the markets and enters into many kitchen preparations, as well as some other secondary products.²¹ While overseas export commerce found no use for these seeds, they are of great regional commercial importance. Note that although the shea and the African locust trees were not deliberately planted until very recently, farmers did protect them. Yields of the trees improve when they are incorporated into a farm, and their very propagation and survival depend on the farming and fallow sequence. Farmers spare these trees when they clear new farms.²² When a sorghum field has, as is commonly the case in our project area, 5 to 10 shea trees standing, they bring in a revenue of about 3,000 CFA francs per hectare. Two or three locust trees in the same hectare bring in 5,000 CFA francs. At the same time, their shade reduces the grain crop yield by 50 to 70 per cent, and in the case of a locust tree this shade covers up to 200 sq.m.²³ If the total area of the farm cannot be extended, the farm owner may fell some of these trees, and thus forgo their valuable produce, in order to obtain larger grain harvests. This system of 'careful balance' has been dubbed the traditional agroforestry. It provided the model for the fruit tree orchards, the new agroforestry, which we shall describe in the section on 'Mango and other orchards'.

Another forest commodity was kapok, which is produced by two unplanted species, Ceiba pentandra (L.) Gaertn. and Bombax costatum Pellegr. and Vuillet. In

¹⁰ Yves Person, Samori: Une revolution dyula (Dakar: IFAN, 2 vols., 1968), vol. 2, pp. 929, 931, 938, 941.

¹⁶ In the late numeteenth century in Gabon rubber plants had already been almost exterminated under export pressure. Alfred Molony, *Sketch of the Forestry of West Africa* (1887), p. 90, quoted by Grove and Falola, 'Chief Boundaries', pp. 5–9.

¹⁹ M. Şaul, 'L'économie formelle du cercle de Bobo-Dioulasso, 1899-1930', Paper presented to the colloquium, 'Le Cercle de Bobo-Dioulasso dans le Processus d'Intégration des Colonies Ouest Africaines', Bobo-Dioulasso, December 1997.

^m Burkina Faso as a whole is a *shea* tree heaven. The savanna woodlands dominated by *shea* trees are estimated to amount to 6.5 million hectares, about a quarter of the total land area: J.J. Kessler and C. Geerling, *Profil environmemental du Burkina Faso* (Wageningen, 1994), p. 44.

E. G. Bonkoungou, 'Monographie du Néré, *Parkia biglobosa* (Jacq.) Benth., espèce agroforestière à usages multiples', (Ougadougou: Centre National de la Recherche Scientifique et Technologique, Institut de Recherche en Biologie et Ecologie Tropicale (IRBET), 1987).

In the village of Dolékha in northern Côte d'Ivoire a study found that between 1962 and 1993 the parkland with shea and locust bean trees had become much richer following the expansion of the farmed area for cotton and cereals. L. Bernard, M. Oualbadet, Ouattara Nklo and R. Peltier, 'Parcs agroforestiers dans un terroir soudanien: Cas du village Dolékha au nord de la Côte d'Ivoire', *Bois et Forets des Tropiques*, 244 (1995), pp. 25–42.

J. J. Kessler, 'Agroforestry in Burkina Faso: A Careful Balance', International Agricultural Science, vol. 63, pp. 4-5.



Photo 6.1a,b,c *Parkia biglobosa* (néré or dawadawa): the tree, the flower, and a woman carrying her harvest of beans. (Photographs 6.1–6.3 by M. Saul)





Photo 6.2 Butyrospermum paradoxum (shea or karité). The caterpillar (situmu in Jula, kpiye in Bobo) that thrives on the tree in the rainy season is gathered and eaten.



1920 the *kapok* production of the *cercle* of Bobo-Dioulasso was estimated at 10 tons. While *kapok* is now known mostly as a stuffing for pillows and upholstery, it used to have industrial uses. The international demand for these latter needs subsided over time and the commodity lost its visibility in foreign trade.

The cases of Butyrospermum p., Parkia b. and kapok contrast with that of the Landolphia vine, because their commercialization has been environmentally benign. Despite the tremendous trade interest in the first two in particular, their intensive harvesting did not lead to the destruction of the trees. On the contrary, their role in 'agroforestry' intensified and production figures went up, even when the agronomic establishment was indifferent to them. The different impacts of commercialization resulted from the different ways in which the tree crops became part of the rural economy. The gathering and harvesting of shea nuts and locust beans was one of the economic activities of women. It was motivated by the contractual obligation of women to provide condiments within the household and by their desire to generate autonomous income. In both cases most community members were supportive of these objectives, and there was widespread interest in protecting the trees and resolving potential conflicts by regulating their use. Rubber, by contrast, was externally imposed and it provided few benefits as long it was tied to fiscal obligations. The gathering of the latex fell upon the dependent household members, and this situation exacerbated intra-household tensions. Few people were motivated to safeguard the survival of the plants, while, on the contrary, some stood to benefit from their disappearance.

Very recently, in one of the many startling turns that tree-planting fervor is taking in Burkina Faso, there is a trend to make *Parkia biglobosa* a plantation tree, including it in the jump from the traditional agroforestry to the new one. Aspiring plantation owners are purchasing the seeds in large quantities and experimenting with different techniques of planting them over parcels of several hectares, even though the rate of failure in establishing the seedlings is high because the process has not yet been mastered. The pioneers for this trend seem to be urbanites, as we shall see later in the case of fruit trees as well.

Peanuts and Cotton from the Colonial Period to the Present

The colonial era inaugurated several trends of agricultural innovation, especially involving industrial crops, primarily oil crops – peanuts and sesame – and cotton. Cotton has grown in importance up to the present and has clearly discernible impacts on land use. Farmers have also transferred some of the technology of cotton-growing to cereal-growing. These developments, separately and in interaction with each other, have worked simultaneously to expand the area under cultivation and to eliminate fallowing. This, in turn, has placed increasing pressure on spontaneous vegetation.

Peanut production started to grow between 1928 and 1932, in response to the world economic crisis. Peanuts were produced as a subsidiary crop and fitted in a particular way into the crop rotation pattern. They were sometimes intercropped in cereal fields, where they also served as a ground cover. They could also be grown in separate parcels, and this has increasingly become the case in the last few decades. The advantage of peanuts is that they require little weeding, and are thus not very demanding of labor.

In the colonial period, peanut areas went from 55,000 hectares, producing 25,000 tons in 1937 to 110,000 hectares producing 46,000 tons in 1942. An oil press was opened by the Compagnie Française de la Côte d'Ivoire, in Kiribina near Banfora. Colonial intensification programs primarily involved the extension of cultivated surfaces and not the increase of yields per unit area. Such programs might therefore have led to higher rates of clearing new land. But because peanuts were always subsidiary to grain cultivation in this region, this did not happen.

Since independence the area under peanuts has effectively increased. Until the 1990s the area under peanuts was larger than that under cotton, which made it the largest non-cereal crop. With the strides that cotton has made in recent years this is no longer true. In the project area peanut parcels are commonly located on old fields near the village that have been retired from cereal cultivation. This makes the initial preparation an easy step, although the parcels are now often ploughed before planting and manured or fertilized later. Peanuts thus extend the useful life of old fields and simultaneously prevent them from going back into fallow.

We have already noted that colonial planners did not always distinguish between increasing food production for the well-being of the population and increasing exportable crops. The encouragement of peanuts illustrates this confusion. Senegal had demonstrated the success of peanuts as a major export crop since the end of the nineteenth century, but the authorities also promoted peanuts for food security. The encouragement of peanuts was part of a broader strategy of promoting subsoil crops, in order to limit the periodic ravages of locusts. A report from 1900, when the war of colonial occupation was still raging, reads: 'Serious propaganda has been carried out in favor of the cultivation of manioc, sweet potatoes, peanuts, cowpeas, harvests which will help people live when their farms have been destroyed by locusts.'²⁴ A report four years later reads similarly: 'We constantly exhort the natives to increase their underground crops, to extend their farms of tobacco and cotton'.²⁵ These 'exhortations' had no impact in extending aggregate farm area.

Sesame occupied smaller surfaces and fits, in the region of Bobo-Dioulasso, at the opposite end of the crop rotation cycle. Many people plant it during the first year in which they clear a new parcel, to hold the ground until the second year when grains are planted after a more thorough cleaning.

Cotton is by far the most important industrial crop of Burkina. It had a turbulent history in the colonial period. Only after independence, and especially in the past two decades, did it emerge as a great success story. In 1997 the surface area devoted to cotton production was around 325,000 hectares, over 9 per cent of all farmed land in the country. No other crop besides food grains comes even close to having this kind of centrality in farming, and there can be no doubt that the history of cotton is an important part of the evolution of plant cover in the country.

The French colonial authorities systematically promoted the production of cotton by compulsion. The drive started in 1902 when the textile industry in France was in crisis because of speculation in the United States, then the world's leading cotton producer. However, this initiative had no impact until after World War I. With the constitution of Upper Volta as a separate colony in 1919, the government decided that the production of cotton for export was going to be its main vocation.

In our project area some farmers had produced cotton in pre-colonial times for the local weaving industry, but it was not grown everywhere, and was at best only a subsidiary crop. Neither the quantities of cotton that the producers offered nor the high prices that the weavers paid for it allowed this cotton to become an export commodity. When the colonial government started to promote cotton for export, the farmers failed to respond with enthusiasm, and the administration resorted to coercion. Between 1924 and 1929 cotton was produced in fields supervised by colonial chiefs and agents of the administration. Production went from about 300 tons in 1923–4 to 3,528 tons in 1924–5 and 6,238 tons in 1925–6.²⁶ In that year, in order to increase production more rapidly, the administration enjoined the creation of joint village fields with sizes proportional to the population, 4 hectares per 100 people. The measure backfired and cotton production took a downward turn, never again in the colonial period reaching the peak of 1926. Cotton exports fell to insignificant levels after 1930. The government ended up withdrawing the coercive measures. Nevertheless in 1928, during the export cotton 'crisis', the representative

²⁴ Archives Nationales Côte d'Ivoire, 5EE 21 Cercle de Bobo-Dioulasso, Rapport Administratif: Agriculture, 2e trimestre 1900.

²⁵ Archives Nationales Côte d'Ivoire, 5EE 21 Cercle de Bobo-Dioulasso, Rapport Agricole, 1er trimestre 1904.

²⁶ T. Hartog, 'La culture du coton dans l'Ouest voltaïque', *Cahiers du L.U.T.O.*, 2 (1981), pp. 75–107; and A. Schwartz, 'Brève histoire de la culture du coton au Burkina Faso', *Découvertes du Burkina*, vol. 1 (1993), pp. 207–37.

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of French textile interests in the colony claimed that 25,000 tons of cotton were being produced and sold to the local weaving industry.¹⁷ While these rhetorical figures may have been exaggerated, cotton production to supply local weaving did continue after the forced export crop regime collapsed.²⁸

The production of cotton for export gained new life after independence, entering a spiral of sustained growth in the 1970s. Several organizations offered new incentive packages premised on the principle of voluntary participation, and cotton production reached new records in every decade. Most of this production was in the western part of the country. The high points were: more than 35,000 tons in 1970: about 77,000 tons in 1980; 115,000 tons in 1986; and nearly 190,000 tons in 1991. Now grown exclusively in single stands, the surface area under cotton went from about 50,000 hectares in the mid-1960s to 185,000 hectares in 1991. After that year, however, export production fell rapidly for two years in a row, down in 1993 to the unexpectedly low level of 116,000 tons. The setback was triggered by an infestation by a caterpillar, Heliotis armigera. The crisis was hard to overcome despite highly favorable conditions, the devaluation of the CFA franc in 1994, and a phenomenal increase in world cotton prices. In 1997 export cotton production reached a new high, 334,000 tons – 75 per cent above the previous high of 1991. The sales accounted for half of all the foreign-exchange earnings of the country. Despite this new triumph, cotton remains very sensitive to price fluctuations and dependent on the smooth operation of the purchasing network and credit programs.

Growth went together with an impressive increase in yields, from about 300 kg of grain cotton per hectare in the 1960s to about a 1,000 kg in the 1980s. Well-todo, skilled farmers, who have several hectares under cotton, now obtain yields of more than 1700 kg per hectare. These yield increases were achieved by using chemical fertilizers and insecticides, more experience and better laboring techniques, and the adoption of animal traction. There is even a growing number of tractors purchased not only through credit programs but also with private savings.²⁹ Worries about the various long-term effects of fertilizer use are occasionally voiced in different quarters. They range from increasing acidity of the soils to its impact on drinking water and aquatic life, but these voices are muffled in the euphoria of higher household incomes and national export revenues.

Cotton is grown in a range of patterns. Today many farmers still have only one or two hectares of it and for them it is simply another crop in the rotation cycle. The cotton parcel is located on the oldest part of the farm, where sorghum or maize had been grown for several successive years. In these parcels the clearing of the spontaneous vegetation is very advanced. The stems of the felled trees are now

- ¹¹ M. C. Henry, 'De la naissance à la remise en question d'un métier: encadreur', 3e cycle doctoral thesis, EHESS, 1988, quoted by Schwartz, 'Brève histoire', pp. 215–16.
- ²⁸ For the example of the Katiali region in northern Côte d'Ivoire where the importance of the local weaving industry contributed to the failure of colonial cotton export policies, see T. J. Bassett, 'The Uncaptured Corvée: Cotton in Côte d'Ivoire, 1912–1946', in A. Isaacman and R. Roberts (eds), *Cotton, Colonialism aud Social History in Sub-Saharan Africa* (Portsmouth, NH and London: Heinemann and James Currey, 1995), pp. 247–67.
- For a case study conducted in the large cotton producer village of Boho-Kari, which is near our Sara-Hantiaye site and where a good number of farmers own tractors, see Philipe Tersiguel, Le par du tracteur: La modernisation de l'agriculture cotonnière au Burkina Faso (Paris: ORSTOM, 1995).

mostly rotted away, the deeper roots have mostly disappeared and there is no sucker regrowth. Even trees left standing in the early years of the farm, have been gradually cleared away to get more sun and achieve a smoother plowing surface. Farmers say that at this stage the soil of the parcel also has better qualities for the cotton plant. Once the cotton is finished, however, in the following year most farmers put the parcel back under sorghum or maize, for a new cycle of cereals that may last a few years. The intervening year of cotton stops the progress of parasite and weed infestation, which is the main reason for abandoning cereal fields, and the residual effect of the cotton fertilizer helps subsequent cereal yields. While this is happening, in the second year the cotton parcel is moved to a new location on the farm that has also been farmed for many years, and on the third year to yet another location, and so on. The cotton parcel also benefits in protection against parasites from being moved around on the old grain parcels of the farm. This practice rejuvenates the farm for both cotton and cereals and has made possible an extension of the uninterrupted use of farm sites. A few farm histories reveal that, within a farm covering 8 or 10 hectares of suitable land, farmers who follow this schedule can put the entire surface under cultivation continuously for twenty years or more. As more and more people do this, the older practice based on a sequence of five years of farming followed by at least fifteen years of fallow is becoming a thing of the past. This intensification involves not the shortening of the fallow period, but instead more years of uninterrupted field use with a new crop rotation.

The second pattern for cotton growing is large farms of 6 hectares or more. In these farms cotton has become the main production activity. Some cotton farmers have 18 hectares under cotton, and buy some of the food that they need for their family. For the first time, cotton expansion is responsible for an increase in the total cultivated area of the country and is entering into competition with food grains. So far, cotton growth has not obstructed food grain production, which has also increased. The expansion of both cotton and cereal farms, however, is changing the plant cover because there is less fallow land and fewer of the plants characteristic of that transition.

Cereal farming remains very important. Of Burkina's farm area 85 per cent is thought to be under food cereals. However, between 1963 and 1988 the total farmed area in the country increased by approximately 60 per cent.³⁰ This is probably still below the rate of population growth over the same period, but considering that about 35 per cent of the population is less than ten years of age, it is most likely above the rate of increase of the adult population. If one also notes the gains in yields – 50 to 60 per cent in cereals and quadrupling in cotton – the tremendous growth of total agricultural output in the country is beyond any doubt. The western part of the country including our project area is responsible for much of this increase. The expansion of cotton, the most reliably documented crop, indicates that the growth of cereals is no longer the engine of the overall expansion of farming, either in surface area or in crop value.

The principal cereals of the savanna used to be red and white sorghum and millet (*Pennisetum*). These remain important in many places, yet in some parts of western Burkina Faso maize has become more important than all three of the older cereals

³⁰ This figure has been calculated from Kessler and Geerling, Profil environmemental, Table 6, p. 32.

put together. In the old days these cereals were intercropped, with each other and with legumes, vegetables, and other kitchen crops, practices which are now oldfashioned and small-scale. The spread of plows has made it more important for the farmer to have a clear flat surface with which to work. Fields are gradually cleared more thoroughly, and fewer trees are left standing.

The use of fertilizer, but not insecticides, has also become almost universal, especially with maize parcels, despite the withdrawal of all subsidies for chemical fertilizers since 1987. This fertilizer is often obtained from the cotton agency on credit, and has become an incentive to add a small parcel of cotton to the farm. The indebtedness following the cotton setback of 1991 arose from the fact that fertilizer purchases from the cotton agency were much larger than what was needed for growing cotton. Medium-size farm owners obtained fertilizer for their grain fields on cotton credit, intending to pay it back with the proceeds of their small cotton parcel. The cotton failure of 1991 demonstrated that this strategy may end up in large debts that burden the farmers for many subsequent years following just one bad cotton year.

From statistics concerning the nation in its entirety it may be surmised that unused land is abundant in Burkina Faso, but this impression is misleading for particular areas. Land shortage in the central part of the country has been acknowleged for a long time, but now the same is true for the fast-growing areas of the west, although they have lower population densities. Many localities in our project area are experiencing land shortage. Fallow land is becoming very scarce, swamp rice is invading riparian zones, and the culturally and ecologically significant distinction between 'bush' and 'farm' is eroding. Part of the reason is that the expansion – whether in cereals, cotton, or fruit orchards – is driven by the desire for market sales. Therefore areas that are accessible by car are filling up with farms at a rate totally out of proportion to their population growth. The standard demographic measures of farm potential and development are becoming now less and less relevant. Not all of these features of the rural dynamism of Burkina Faso are due to the development efforts of the past decades, but these efforts did nurture them, in both their positive and not so positive aspects.

The rural development efforts of the independence period evolved in a 'multilateral' context. This is different from the colonial period, when the 'commandant' stood for the expert interpreting the directives of the 'ministère', and development was a matter of administration. However, the new situation has not encouraged greater local autonomy. Agricultural and environmental research has been carried out by expatriate experts, working in organizations funded by multilateral agencies, and projects remain initiated and guided by external centers of decision-making. The capital funds and the philosophies have their origins not in the region, not even in the national state, but in international donors and constituencies. After 1983, with a new political orientation in the country, a partial attempt was made to change this situation by spelling out national research and policy priorities. A Land Act (Réorganisation Agraire et Foncière) and an Environmental Code were enacted, and the scientific research institutions, which are independent from universities in Burkina, were reorganized. The extent to which these changes alter the extrovert nature of research and development efforts remains to be seen.

Major Development Projects of the Recent Decades

So far we have dealt with private farms, mostly owned by smallholders, a large number of whom still have as their main farming target feeding their own household, even if they are being imperceptibly drawn into a deeper engagement with the market. This section reviews the other major development undertakings since independence: plantation agriculture, settlement of river valleys, dam construction, internal migration, and growth in cattle population. They had nontrivial social consequences and contributed to the reduction in fallow land, which is transforming the spontaneous vegetation cover.

The first important case is a large-scale industrial sugar cane reduction enterprise in the Bérégadougou plain, established in 1972. It was run by the Comoe Sugar Company (SOSUCO) and covered 10,000 hectares. There is no other agricultural operation of comparable size in the country. The plain was emptied of its occupants, water was piped in from the upper reaches of the Comoe, and a highyield irrigated perimeter of permanent cultivation was put in place. The undertaking had a major impact on the hydrographic system of the area. The expropriations, monetary compensations, and resettlement of the population had social consequences that we know only from anecdotal evidence. At the same time, the fields and the sugar factory and distillery created many jobs, especially for women.

A different initiative but with similarly broad environmental and social consequences was the Sourou project which was planned to bring irrigated agriculture to the Sourou river valley. In the 1980s this project became a hot political topic, when the government decided to allocate part of the project area to unemployed young university graduates. The unemployment of people with advanced degrees is new and is perceived as an acute problem. Until recently the country had the reverse problem, a shortage of people with higher education. Overshooting in the opposite direction came suddenly and accelerated quickly. Just as the investments made since the 1960s in higher education started to pay off, producing a large number of graduates, civil service employment began to shrink under structural adjustment programs. The private sector provides less than 10 per cent of non-agricultural jobs in the country. The Sourou project was offered as a solution, and as a way of seeding a new dynamic entrepreneurial class of educated farmers. This vision has not yet been translated into reality, while the policy has been criticized in principle and in terms of its suitability for its stated goals.

An earlier, more ambitious resettlement and agricultural development project was the Volta Valleys project, a national sequel to the international effort to eradicate river diseases in a group of neighboring countries. In the late 1970s the Volta Valleys Authority (AVV) received large amounts of multilateral development funding.³¹ It did not achieve its grand original objectives, but it did effectively open up the valleys to agriculture, not only with official settlers, but also by building roads and social services and bringing in its wake an inflow of independent farm operators. Crowded communities now lived in places that until recently had been very sparsely populated. Movement to the Sourou and Volta valleys accounts for a

For the AVV, see D. E. McMillan, Sahel Visions: Planned Settlement and River Blindness Control in Burkina Faso (Tucson: University of Arizona Press, 1995).

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good part of the expansion of farmed areas in the country. In the process, large areas of fringing and dense dry forests were cleared, sometimes with heavy machinery. In the Bondokui region between 1952 and 1981 the fringing forests may have shrunk by 70 per cent. During the same period farmed surfaces went up by 200 per cent, basically at the expense of the vegetation of the lower parts of the catena.³²

The construction of dams – for hydroelectric power, irrigation, or the supply of water to the cities – is another major development theme. The dams are of varying scale and scattered throughout the country. In 1987 there were 714 of them with a total water holding capacity of 400 million cubic meters. Most of these are small-scale and support only modest irrigated perimeters. The irrigation dams sometimes flood more good land than they make available, but some of the vegetable-growing schemes around them have been minor success stories. Another serendipitous result has been a greater supply of fish. For example, fresh fish has entered the daily diet of the inhabitants of Ouagadougou in a way that was not anticipated twenty-five years ago, and the experience has been similar, albeit at a smaller scale, elsewhere. Endogamous fish professionals, migrating from the Niger valley in Mali, have now established themselves in Burkina. Our project area now includes one of the largest recent projects, the Nyofila hydroelectric power plant, located on the hills of one of the feeding branches of the Leraba. The works consist of two reservoirs, the upper one powering the plant and the lower one collecting the water for irrigation.

Two other social and economic processes had important consequences for the wild vegetation cover. One is the stream of migrants from the lower-rainfall northern parts of Burkina Faso to its eastern, southern, and western parts, including our project area. For the past three decades, this demographic movement has been one of the principal themes of the social science and development literature in the country. The flows started in the late colonial period, but accelerated during the drought years of the early 1970s, and are an important component of an impressive growth of cereal and cotton production in the receiving area (see the chapter by Leslie Gray in this volume). There is now a literature alarming experts about the negative consequences of this migration. The warnings are based on different considerations, including the destruction of fallow land, but mostly stress the landwasteful cultural disposition of the migrants themselves. However, population density and farmed area are increasing everywhere, and the shrinkage of fallow land, as we have seen, is a common consequence. Naturally all of this is happening at a faster rate where agricultural potential is greatest, namely, in the west. Migration should be seen not as a special environmental threat, but as part of the general transformation of farming practices.

The second process involves cattle, which we have not taken up anywhere else. Our project area now includes numerous large herds mostly owned by wealthy Fulbe proprietors who have them herded by young Fulbe migrants brought by them from the north. The herds of western Burkina Faso had been heavily reduced during the colonial occupation and in the first decades of the century, by expropriation, taxation, and plunder. They were reconstituted in the 1970s, primarily from stock moved down from the Sahelian regions during drought years. Other developments have also contributed to the increase of cattle in our project area. Numerous plow acquisition credit programs since the 1960s encouraged village farmers to purchase animals. The monies from grain and cotton sales allowed some well-to-do farmers to invest in oxen, cows and calves. Farmers take care of these animals as part of their household resources. The prevailing entrepreneurial spirit motivates many such farmers to look after these animals within the household instead of entrusting them to Fulbe herd owners as in the past.

The combined result is a large increase in the number of cattle. Since the 1970s animals on the hoof and animal products have been consistently the country's second or third largest source of foreign exchange. To measure the effect of grazing on the evolution of the flora was not one of our project aims. Nonetheless, grazing is related to agricultural change. Some herders have manure contracts with farmers, in the dry season bringing their animals to the empty fields to feed on the stalks in return for the benefit of the dung left behind. Those villagers who own animals pen them similarly in their own fields. The increased manure has contributed to the lengthening of the period of uninterrupted use of field sites. Thus the presence of cattle has become integral to the move to a more permanent farming style. At the same time, large herds owned by outsiders are causing a growing number of conflicts between farmers and herders because of crop damage.

What is the effect of larger herds on the vegetation? With many more animals to graze, there is more stress on grasses, although animals do not eat only grass. Tree leaves are an important part of their diet, especially in certain months of the year, and in our project area several choice fodder species, *Pterocarpus erinaceus* poir., *Cajunus Kerstingii* Harms, and *Khaya Senegalensis* (Desr.) A. Juss., are both depleted and protected by the wandering herders.³³ One outcome of the increased presence of cattle may be conditions more favorable to tree growth in the grazed bush savanna (see Chapter 3 in this volume). Casual observations by local people indicate a greater density of shrubs and trees in the bush compared to the past. Thus, on the one hand, most things seem to conspire to reduce the fallow land successions and to produce a more tightly domesticated landscape, with farms, orchards, and less plant diversity. On the other hand, the development of herding seems to be creating conditions favorable to denser dry woodlands in between the farms.

Land Use and Cover Between 1952 and 1983

The trends described so far are evident in the evolution of farm and fallow land in six project sites over a period of about thirty years, as documented by two sets of aerial photographs taken in the 1950s and 1980s. The areas that we mapped are small, and therefore cannot provide conclusive evidence for the commentary that accompanies them. But the illustrations do show variation between sites and allow a more detailed discussion of some of the practices transforming land use.

³² J. L. Devineau and G. Serpentié, 'Paysages végétaux et systèmes agraires au Burkina Faso', in M. Pouget (cd.), Caractérisation et suivi des milieux terrestres en régions andes et tropicales (Paris: ORSTOM, 1991), pp. 373-83.

For an exhaustive empirical study of tree lopping by Fulbe herders in western Burkina Faso, see S. Petit, 'Environnement, conduite des troupeaux et usage de l'arbre chez les agropasteurs de l'ouest burkinabe', Doctoral thesis, 2 vols., Université d'Orléans, 2000.

| Sara-H | lantiaye | B | are | Soum | ossno | P | éni | Boug | çoula | Kank | alaba |
|--------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1952 | 1981 | 1952 | 1981 | 1952 | 1991 | 1956 | 1983 | 1956 | 1983 | 1956 | 1983 |
| 3.30 | 12.36 | 10.61 | 28.75 | 1,33 | 33.17 | 44.28 | 28.87 | 35.77 | 36.16 | 18.08 | 11.79 |
| 3.80 | 2.38 | 3.10 | 4.00 | 2.21 | 11.50 | 9.55 | 9.12 | 5.11 | 3.14 | 1.57 | 4.71 |
| 91.00 | 84.60 | 82.53 | 65.05 | 92.92 | 52.23 | 46.17 | 62.01 | 59.12 | 60.70 | 80.35 | 83.50 |
| 1.90 | 0.66 | 3.76 | 2.20 | 3.54 | 3.10 | | | | | | |

Unfarmed

Farmed Fallow Riverine

Table 6.1 Land

pain () LAND

house **BECKY STOCK**

unlarmed



Figure 6.2a Land use in Sara-Hantiaye, 1952



Figure 6.2b Land use in Sara-Hantiaye, 1981

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Figure 6.2c Land use in Sara-Hantiave, 1952 and 1981

The six sites are Sara-Hantiaye, Bare, Soumousso, Péni, Bougoula and Kankalaba. They are scattered through western Burkina Faso in zones with different agricultural histories and topographies. They vary in terms of demography and migration status, and in the ethnic characteristics of the population, which is heterogeneous. Sara-Hantiave, a Bwa village in the cotton region, is the northernmost site. The next two sites, Bare and Soumousso, are near each other and show the contrasting and yet similar impact of current developments on two situations starting from different historical baselines. The photographs in all three cases come from the coverage of 1952 and 1981. The fourth site, Péni, shows a mix of the characteristics of the other sites. The final two sites, Bougoula and Kankalaba, are clustered in the Tagouara plateau, which is hilly, remote from, and until recently not well connected to, the national center. Over the past three decades the Tagouara plateau became the site of agricultural innovation combining cereal and fruit orchard cultivation, which has raised incomes and spurred the interest of national elites. The coverage for Péni and the last two sites comes from the photographs of 1956 and 1983.

We present the maps resulting from the photographs in Figures 6.2 to 6.7 and summarize the data in Table 6.1. The maps separate the surface area into four categories: farmed, fallow, unfarmed, and riverine forest, and the bar charts aggregate the proportion of area in each category.³⁴ Farmed area refers to stretches of land with a mix of crops, including the trees that have been spared during clearing for the farm. Fallow land refers to former farm sites, recognizable on the



Figure 6.33 Land use in Bare, 1952 and 1981

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³⁴ Cf. J. R. Anderson, E. E. Hardy, J. J. Roach, R. E. Witmer, A Land Use and Land Cover Classification System for Use with Remote Sensor Data, USGS Professional Paper No. 964. (Washington, DC: USGS, 1976).



Figure 6.3b Land use in Bare, 1952 and 1981

photographs by their artificial shape with a lower density of plants, in different stages of succession toward savanna woodland. Unfarmed area refers to what is not recognizable as farm or fallow land. It includes both areas that support little vegetation, and more extensive areas that are wooded or bushy. Within the general unfarmed area. we single out riverine forest. With the spread of fruit orchards, distinguishing plantations from woody 'unfarmed' areas presents technical difficulties. This has a bearing on our commentary.

Sara-Hantiaye. Our northernmost site, Sara, is a large Bwa village located north of the Maro classified forest. In the 1952 map it appears as a well established agricultural community, with approximately equal amounts of land under cropping and fallow, and plenty of uncleared bush (Figure 6.2a). In 1981, there is about a fourfold expansion of cultivated areas, while fallow and uncultivated bush go slightly down (Figure 6.2b). Riverine forests have also decreased as the stream banks have come under cultivation. This village is still well endowed with land and has plenty of uncultivated bush, although some of it is hilly and difficult to farm.

The two maps cover an area that is more than twice the size of the area covered by the maps of the other cases and allow us to take note of the effect of migration on agricultural expansion. While the cropped areas of the village have increased at the expense of fallow land, one can see in Figure 6.2b that most of this increase is due to the colonization of a separate bloc to the west of the village, on territory that was empty in 1952. This new bloc has farm areas three times larger and fallow areas five times larger than the village itself. Migrants who have arrived from the north and who are mostly Mose occupy this new zone. They grow primarily cotton, sorghum, and peanuts. They also provide most of the labor for the forest



Figure 6.4a Land use in Soumousso, 1952 and 1981



Figure 6.4b Land use in Soumousso, 1952 and 1981

maintenance and development work carried out by a government agency in nearby forests. The area farmed by the migrants is separated from the village by a ridge of uncultivated hills.

Bare-Soumousso. The maps of Bare cover an area with a radius of about 3 km, which represents only a portion of the territory on which the villagers have their farms. Some families in this old and well populated village (with an approximate population of 2000) possess rights to land at large distances, and the farms of some villagers included in a survey conducted in 1983 were 10 or 12 km south of the village.³⁵ These areas were very old fallow lands that had become shady woodland where fire could not penetrate. Young members of the families were clearing farms there to reassert customary rights and protect them against claims from outsiders.

Nonetheless, the maps in Figure 6.3 provide a sense of the general trend of development in farmed area from 1952 to 1981. Farmed area has tripled within the radius shown, most of the extension being to the south of the village, where most village families have land rights. The riverine plant cover has nearly disappeared between these two dates, except for two locations that have been spared for ritual activities. There were mango tree plantations near the core area of the village, and cashew tree (Anacardium accidentale L.) plantations established by neighboring villagers for commercial purposes to the north of the mapped area which do not appear in this figure. The planting of trees, both of the fruit variety and of the timber species propagated by extension services, has accelerated since 1981, and plantations can now be found far from the habitation area.

The village of Soumousso (Figure 6.4) illustrates the most dramatic impact of migration on the extension of farmed surfaces. Until the 1960s this was a small hamlet with a few families of Tiefo origin. Since then it has received a large influx





Figure 6.5: Land use in Péril, 1956/7 and 1983

³⁶ For agriculture in this village see M. Şaul, 'Farm production in Bare, Burkina Faso: the technical and cultural framework of diversity', in G. Dupré (ed.), Savoirs paysans et développement (Paris, 1991), pp. 301–29.



Figure 6.5b Land use in Péni, 1952 and 1983

of Mose settlers to whom the original inhabitants have lent their lands. Thus both inhabited area and farms started to expand. In the 1951 map the surroundings of the village are almost empty, except for a few fields in the northern edge of the map, which were farmed by the inhabitants of Bare. In 1981 35 per cent of the mapped area is under cultivation, a proportion larger than that of Bare. Most of the farms are under sorghum, millet and maize, and the village sells a large quantity of grain to merchants. The land greed of the settlers has caused conflicts between them and the inhabitants of Bare, as well as tensions among land controlling groups in Bare.

Péni. The maps of this village, representing an area with a radius of about 4 km, seem to show a reduction of farm area from 1956 to 1983 (Figure 6.5). However, if the 1956 farm areas had been abandoned, by 1983 one would expect to find in their place a larger area under fallow land. That this is not the case hints at one of the interpretative problems that we encountered. In fact, ground observations show that much of the area appearing as bush in the 1983 map is under mango orchards. Starting in the mid-1960s this village, with many others to its west, started systematically to convert cereal fields into mango orchards by a cropping pattern that we discuss below. The village is on a national highway and has attracted many settlers from near and far. Besides the local and neighboring populations of Tiefo. Sambla, and Jula origin, the ethnic mix includes Bobo, Bwa, Lobi, Mose, and Fulbe settlers. The mango orchard business has brought large revenues to households, and vast areas around the core of the village and far into the bush are under mango groves. This is the most important effect of new farming practices on the evolution of the vegetation in this village and the far western zone that is the Tagouara plateau.

Bougoula and Kankalaba. These two sites on the Tagouara plateau differ from each other and from previous cases, and exhibit certain important features of this part of the country. The maps of Bougoula show farm areas slightly larger in 1983 than in



Figure 6.6a Land use in Bougoula, 1956/7 and 1983





1956 (Figure 6.6a). Note that this village is very intensively farmed and the proportion of farm to fallow land, which was already high in 1956, is even higher now. Kankalaba shows an increase in fallow land between 1956 and 1983 (Figure 6.6b). The village territory of Kankalaba is extraordinarily hilly. People here adopted farming techniques unlike those anywhere else, using special tools and practices such as terracing. The difficulties of farming have motivated the inhabitants to go to distant areas in the region and request farm sites from other villages with less hilly surfaces. The topography of the village also discourages expansion of production by making it difficult of access for trucks and cars. The combination of these factors pushed this village into agricultural recession, showing the uneven effect of developments.

The Tagouara plateau is undergoing a phenomenal development of fruit tree plantations, which is not revealed in our mapped cases. Crucial in this development was the proximity of Orodara. Continuing the early colonial efforts started in Banfora, in the early 1970s this town became the primary node for the spread of mango, citrus, and other fruit tree seedlings and related technical knowledge. Farmers around the town perfected the transition from cereal farm to orchard, a practice that is now universal. No family in this area farms only food crops as was the case in earlier days.

Another plant that is undergoing tremendous expansion around Banfora and in the Tagouara plateau is the ban palm (Borassus aethiopum Mart.). Its abundant sap can be tapped, ferments quickly, and is sold and consumed as palm wine. In this region it has always been planted from seeds, but with the growth of the market the plantations have become much larger and more numerous. The mature plant can be tapped several times during its short life, and with a useful life of a few years it stands half-way between annual crops and longer-term fruit trees. In many villages one now finds farmers who own plantations of 1,000 or more of these palm trees.

One final development concerning the Tagouara plateau deserves mention. The profitability of combining food crops and orchards has brought the plateau to the



Figure 6.7a Land use in Kankalaba, 1956/7 and 1983



attention of the national political elite. The trend started with civil servants in the middle rungs of the administrative hierarchy - retired soldiers, schoolteachers, and all kinds of salaried personnel, who had connections to this area and access to land. Now individuals occupying the highest political positions in the country have joined in the development. They secure tracts of more than 100 hectares, farming them in the pattern that has become common: clearing and cereal cultivation in the early years, while planting tree seedlings which will transform the farm gradually into a plantation. They use heavy machinery as well as hiring workers with oldfashioned hoes; they also throw giant work parties with bands of musicians and huge quantities of food. These large farms-on-their-way-to-becoming-plantations are a true mixture of forms, techniques, technology, one could almost say eras, all with a view to producing profits. The Tagouara plateau is not the only part of the country where one observes such a development, but the special interest of this area is evident in the infrastructure that has been built for it. Since the politically prominent people have considerable decision-making power, the Tagouara plateau is now endowed with some of the best roads in the country. It is also being electrified.

In the Tagouara plateau the combination of expanding orchards, wine palm plantations, annual crops, the interest of the national elite, and hilly landscape is producing an acutely felt land scarcity. Besides the disappearance of fallow land, this scarcity is provoking new strategies and conflicts to preserve land rights, which affect relations between the lenders and borrowers of farm sites.

Mango and Other Orchards

1983

The spread of fruit tree plantations in complementarity with grain production is the most noteworthy new development of western Burkina Faso. It is the cultural practice which influences the spontaneous vegetation cover most significantly. If

the trend continues at the pace it has done in the past two decades, it will change the distribution of plant species on a large scale, substituting domesticated foreign trees for the grasses and tree species of the fallow and woodlands. In this section we relate the origins of this trend, show its commercial scale and profitability, then describe how plantations are established, and consider some of the potential consequences for plant diversity.

Fruit tree plantations in Burkina Faso are mostly the work of farming households. Orchards multiplied when household heads followed the example of a few innovators. Orchards started in the 1950s with people of the cities - civil servants, retirees, and merchants - who obtained the seedlings from colonial agronomic stations. This did not result in the concentration of plantations in the hands of a few heavily capitalized ventures. Household farms, on a whole range of scales, replicated the example.

Exogenous varieties of fruit trees entered Burkina in the inter-war period, in the administrative style characteristic of that period. Orders were issued for each household to plant seedlings. Before long, a few people from the privileged colonial stratum - merchants and the Mose chiefs of Ouagadougou - noticed the income possibilities that the orchards offered. In the central plain of the country mango trees do better in depressions or river banks with high humidity, and the Mossi chiefs have customary rights to such land, which, until then, had been of little use. Other political factors were linked to decolonization. In the late 1950s, the Mossi chiefs came into conflict with the new cadres who had graduated from the colonial schools and who constituted the native intelligentsia that was going to take the country into independence. The chiefs were quickly stripped of many of their official duties, and, now facing loss of status, allied themselves to the Muslim merchant community of the capital to go into such ventures as commercial agriculture, meat production for export to the neighboring coastal countries, and transportation.³⁶ The Moro Naba Kougri, the most important Mose chief, had orchards and gardens planted, and shipped fruits and vegetables to Côte d'Ivoire.37 Others quickly followed. In the 1970s René Dumont observed in Banfora and Bobo-Dioulasso plantations of fruit trees, mostly mango 'planted especially by those who have money: people of the cities, civil servants, the military... a new category of absentee owners who have land "allocated" to them by customary authorities...³⁸

Mangoes do marvelously well in western Burkina Faso; papayas and guavas do reasonably well; and for citrus, western Burkina is one of the few places in the region where they can be produced without irrigation. The popularity of mango is also related to its inherent properties as a fruit. It is sweet and therefore high in calories. The fruits come just before the rainy season sets in, a time when most heads of production units are reluctant to bring out the grain stored for the farming season and tend to let women and other dependent members fend for themselves.

Catherine Some, 'Sociologie du pouvoir militaire: Le cas de la Haute-Volta', 3e cycle Doctoral thesis, C.A.E.N., Bordeaux University I, 1979.

E. P. Skinner, 'The changing status of the 'Emperor of the Mossi' under colonial rule and since independence', in M. Crowder and O. Ikime (eds), West African Chiefs under Colonial Rule and Independence (New York and Ile-Ife, 1970), pp. 98-123.

René Dumont, 'En Haute-Volta, une paysannerie à demi affamé', Chapter 5 in Paysans écrasés, terres massacrées (Paris, 1978).

A large quantity of mangoes risk rotting in this period of glut and become food for pigs, the husbandry of which also became popular at the same time in the villages. Despite phenomenal sustained increase in production since the 1970s, the price of mangoes did not drop until the 1990s, as the market expanded at the same pace, within the country and through exports to neighboring countries as well as to the luxury markets in Europe.

In the 1970s Orodara's Regional Development Organization (ORD, supplanted now by the CRPA) became the center for the introduction of new varieties, the production and sale of seedlings, and training. Truckloads, not only of fruit but also of seedlings, filled the highways out of Orodara during the rainy season. In the early 1980s this region was already said to be developing a food-grain deficit. No one in the region thought this a misfortune, though. The prosperity brought by the fruits was such that the development was seen as a boon.

In the early 1980s one good grafted tree could produce a crop worth at farmgate prices more than 2,000 CFAF. Incomes of 4,000 or 5,000 CFAF per tree were common. A plantation of about 10 hectares with 2,800 trees on it, two thirds mangoes and the rest citrus and guava, easily produced net yearly incomes in the range of 4–5 million CFAF – more than \$10,000. For this kind of return, the initial investment was relatively minor. A 10-hectare plantation would be beyond the means of most households, but at a much smaller but still very profitable scale, planting is within reach of the majority of village people in western Burkina, and the investment can be spread over many years.

Fruit trees are planted in two distinct patterns. The first was more common in the past. Some farmers plant a few trees within the walls of their compound or near their house. This initial investment seems negligible, but growing the seedlings to mature trees is difficult. The young trees have to be protected from roaming animals and children, and they do not always survive the dry season. Adding one or two trees a year, it is possible to develop a small stock over time, but in this way the planting cannot go beyond the miniscule stage, because the farmer soon runs out of space. When there are only a few trees, most of the fruit is simply eaten by family members. Now that the trees are almost always of the good grafted varieties, the crop may be bountiful and valuable. There are farmers who allocate one or two good trees to a spouse for cash income. The monetary returns are rarely negligible even at this amateurish scale, but to establish a true plantation a farmer has to turn to the bush fields.

Plantations in the bush represent the second pattern of planting. This is the way the first merchants, civil servants, chiefs and retirees established their plantations and it has become universal among village farmers in the surroundings of Orodara and in the Tagouara plateau, is common around Péni, and is spreading elsewhere in the area of Bobo-Dioulasso. The operation starts with the clearing of a fallow field for cereal cultivation, in the conventional manner. The farm can be more thoroughly cleared and plowed for a second year of cereal cultivation. In the months of high rainfall, July and August, part or all of the farm is planted with fruit tree seedlings between the stalks of the maturing grain. In subsequent years the farm is enlarged by clearing adjacent areas, more land being brought under cereal cultivation. The planting of tree seedlings follows that of cereal cultivation with one or two years' delay. The pace of this expansion depends on the means of the farmer. For a typical successful household, a new farm site starts with one or two hectares, and then expands for a few years with the addition of half or one hectare every year, stabilizing at about 4 or 5 hectares. The loose crop rotation schedule varies with the nature of the soil and other contingent factors.

Previously, portions of the farm that had been farmed for five or six years were abandoned while new areas were cleared ahead. Thus the farm location shifted, until a limit, such as a stream or the boundary of another farm, was reached. Today there is no longer movement, simply accumulation by expansion. Before it is even time to abandon the field as fallow, the seedlings have grown into trees and the cereal farm has transmuted into an orchard. Under the shade grains no longer grow. Some farmers plant shade-resistant peanuts, earth peas (*Voandzeia subterranea* (L.)DC.), or cowpeas (*Vigna unguiculata* (L.)Walp.) under the young trees, but annual agriculture stops completely when the trees are fully grown and producing to capacity. Many farmers continue to plow under them after this point and spread fertilizer to assist tree growth and fruit production. Once the entire tract is planted with trees and they have become mature, the household can only produce cereals by opening a new farm in a different location.

A plantation starts bringing in monetary returns after four or five years, and this revenue can finance the further expansion of the plantation. Most farmers manage their plantation with a keen sense of investment. Besides plowing and fertilizer use, many owners hire a permanent worker to live on and look after the plantation. In the Péni area farmers who had planted their first trees in the late 1960s remember that they had to water the seedlings at great pains in the drought years of the early 1970s, an unheard-of practice. In 1984 when late-bearing varieties became available, many people around Orodara and the Tagouara plateau cut down their oldest trees and planted the new varieties instead, thus forgoing a few years' worth of production to obtain better prices in the future.

A head of household who has engaged in this course stops only because he has run out of land. Within a period of 10 or 15 years a successful farmer can go through 15 hectares, plant it all with trees, and no longer have land suitable for yearly crops. Consequently, a difference is now appearing between the old founding families of the villages, who have ritually expressed rights over plenty of land, and others, more recent immigrants or outsiders, who have borrowed land for farming. The borrowing of land for grain farming was widespread and did not involve substantial payments of rent.39 However, extended plantations do not provide a good reason to ask for more farm land, and the land-owning households are now careful to preserve their own future access to the few still unused sites. There are contradictory processes at work. On the one hand, land belonging to groups is being transformed into plantations controlled by specific individual members who have planted them with trees. On the other hand, groups are keen to assert their collective rights in the face of outsiders, resulting in the 'hardening' of corporate bodies around the land. And trees are now planted not only for revenue but also to maintain a foot in the land against lineage companions, and to forestall future demands by potential borrowers and by long-standing borrowers who want to avoid the risk of eviction. Young farmers, who discover that the family farm,

¹⁰ M. Saul, 'Land custom in Bare', in Bassett and Crummey, Land in African Agrarian Systems, pp. 75-100; idem. 'Money and land tenure as factors in farm size differentiation in Burkina Faso', in R. E. Downs and S. P. Reyna (eds), Land and Society in Contemporary Africa (Hanover, NH: 1988), pp. 243-79.



Photo 6.3 Mature mango trees in the process of being severely lopped in order to rejuvenate them and open the field under them to cropping (Péni).

which they had taken for granted, is located on borrowed land, plant trees to secure their continued access, an action generating very complicated conflicts in which moral sentiments, religious values, and the possibility of legal and administrative intervention by the state pile up to produce inconsistent outcomes.

The new commercial vocation of the Tagouara plateau can also be seen in that it has also become one of the major cotton-growing areas, adding to the shortage of land. In the Kenedougou province, of which the Tagouara plateau is part, almost 67 per cent of the farms are under cotton, in rotation with maize.⁴⁰

This version of land grab, and the resulting land shortage, are stimulating new practices. The trees themselves may soon become a rotation crop. When mango trees age they start to bear smaller crops. Pruning can rejuvenate the tree and restore the yields. It is common in the project area for farmers not only to prune the old trees, but also every so many years to lop them severely, leaving only the main trunks standing. Such drastic treatment does not kill the tree in this area. After reducing the tree to the stem, the part of the plantation where this is done can again be used to plant an annual crop, a legume, or even a cereal crop, for one or two years, before the trees grow branches and start bearing fruit again. Thus there is an

⁴⁰ A. Schwartz, 'Que faut-il penser de la régression de la production cotonnière au Burkina Faso depuis la campagne record de 1990-1991 et de mesures de relance proposées en 1995?', Rapport de Mission, 1996 (mimeo), p. 17. evolving pattern of fruit trees as the main perennial crop, supplemented with periodic cereal or pulse production on the same plot.

On the Tagouara plateau land shortage is reaching a point where some farmers are contemplating felling their oldest fruit trees altogether and bringing a portion of their farm back under grains, only to start the process soon again with seedlings of newly available and more attractive varieties of fruit trees. If such periodic clearing of orchards becomes generalized it will constitute a partial return to the old farmclearing system, but without the succession of woodland fallow. Now the wild fallow flora are replaced with planted trees, the land is exploited more heavily than under spontaneous trees, and there is a concurrent loss of diversity in the managed area.

The contribution of fallow land to plant diversity in our project area was studied as part of our investigation in the Péni site, where our colleague Sanou Dya put in place erosion parcels. The research uncovered the richness of plant life in fallow plots and the extraordinary regeneration power of the wild species. We inventoried some 60 species, ligneous and herbaceous, on these study parcels. Seven species dominated: *Daniellia oliveri* (Rolfe) Hutch. and Dalz. (237 shoots/new plants), *Butyrospermum paradoxum (shea,* 121 shoots/new plants), *Hymenocardia acida* (66 shoots/new plants), *Crossopteryx febrifuga* Benth. (66 shoots/new plants), *Trichilia emetica* (45 shoots/new plants), *Swartzia madagascariensis* (42 shoots/new plants), *Vitex diversifolia* Bak. (26 shoots/new plants). This is the cover that is becoming increasingly scarcer as the countryside becomes shaded by huge mango trees.

Conclusion

In this chapter we have described the long development that started in the colonial period with requisitions, taxation, and the building of roads and a few agronomic stations, and led to the commercial expansion of agriculture and orchards in recent decades. This expansion explains why a large proportion of arable land, previously under fallow, came under planted species. The shortage of farm sites is no longer exclusively a reality of the central plains of Burkina Faso, but also of the western part of the country where our project was situated, and it can no longer be attributed to high population densities. The shrinking of fallow land in western Burkina is driven by the expansion of commerce rather than by the necessity of feeding the members of farm households, and is due to the growth of cotton production, grain farming for market sales, and even more importantly fruit plantations.

The lessons of the colonial period are instructive for understanding some of the changes that are occurring in western Burkina, even though the processes involved and the scale of the transformation are different today. The direct impact of both the extractive and conservation efforts of the colonial government on the environment was limited and inconsistent. We noted, for example, the destructive effect of rubber collection on the *Landolphia* vines, whereas the commercialization of *shea* nuts and African locust beans proceeded without disturbing the local conventions of conservation and production. We traced these different outcomes to the fact that rubber-gathering was an external imposition and exacerbated intrahousehold tensions, whereas *shea* and locust beans remained within the well-

established lines of intra-household specialization that committed the members to co-operate. The use of wood as fuel for transportation and industry, and subsequent decisions to declare classified domains, had mutually correcting effects on the vegetation cover, even though both developments stressed the farming capacity of some local communities. In the case of the fuel use of wood, it is difficult to assess if the colonial period represented a more intensive rate of depletion when compared with the pre-colonial industrial activities.

The most important legacy of the colonial period with regard to the vegetation cover was the commercialization set in motion by the growing urban demand for cereals, the export of industrial crops, and the initial stimulus given to orchard production. All of these tendencies became more pronounced after independence in 1960. These developments combined have resulted in a reduction of the area under fallow, and a more domesticated plant cover in the environment. Many spontaneous plants, both ligneous and herbaceous, which have their habitat in the arable land that is being occupied at an accelerating rate by agri- and arbori-culture, are reduced in number. Increased herding activity qualifies the impact of this process. More cattle reduce the mass of grasses, encouraging shrub and small tree proliferation and contributing to the emergence of a sharper contrast between the areas under planted species and the corridors left uncultivated between them.

We stress that agricultural expansion is not leading exclusively to the spread of farm cereals, pulses, and cotton. In a manner reminiscent of what happened in the forest regions of West Africa at an earlier date with coffee and cocoa, in western Burkina fallow land is being supplanted by trees of a limited number of species chosen for plantations. The choice for these plantations is now widening from imported fruit trees to include valuable savanna species such as *Parkia biglobosa* as well as the *ban* palm. Overall, it is clear that it would be inaccurate to characterize this shrinking of fallow land as deforestation. although it may be true that the result is impoverishment in the number of individuals of many wild species compared with an earlier period, even if the species themselves are not yet disappearing even locally.

Western Burkina represents in many respects a case of successful agricultural development. The initiatives of peasant farmers have created desirable increases in income and total production. This is also happening without creating a mass of paupers in rural areas and without worsening beyond remedy income distribution at the national level. At the same time, the rich spontaneous flora of the savanna is being replaced with monotonous planted orchards and grain and cotton farms. Conventional wisdom holds that the wild savanna was the complex result of centuries of human activity. Recent developments are introducing in a very short timespan a much higher degree of artificiality in this older pattern of human-environment interaction.