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## Agricultural strategies as complementary activities to hunting and fishing

by Serge BAHUCHET, Claude Marcel HLADIK, Annette HLADIK and Edmond DOUNIAS

**I**n the African rain forest, as well as in the tropical zones of Asia and America, agricultural practices differ in many ways from those of temperate zones and savannas. Soil preparation is almost non-existent whereas forest clearing demands most of the energy expended. Trees and shrubs are cut down, left to dry, then burned. Only the largest trees are saved, either because they are too difficult to cut down, or because they yield edible fruits, or because they have medical and/or magical value.

Prior to the first rains, without any systematic hoeing, women bury, after simply digging a hole with a hoe or a machete, pieces of yam tubers, cuttings of cassava, or sprouts of banana plants. Thus cultivation mostly consists of planting live plant parts rather than seeds.

Plants are always intercropped; each field generally includes a dozen or so species, with many varieties of yams, cassava, plantains (cooking bananas), taros and macabos. The majority of these cultivars were introduced from other continents during the past centuries. Essentially they consist of non-seasonal species that produce continuously, without a clear "harvest-period", thus allowing staggered collection throughout the year. Mixing cultivars in the same field enhances this possibility: the plot thus becomes a true "living granary"(1).

Moreover, in the rain forest, herbs and forbs are less common than in the savanna and, therefore, less weeding and care is needed. Cultivators can thus abandon their fields, even

Field preparation among the Ngando. Cutting and clearing must be done during the dry season, using axes and machetes (coupe-coupe). These activities account for the main yearly energetic investment by adult men and women (chapter 4). After a period of about one month, the dried vegetation is burned. Most of the time, burning is only partial; large tree trunks remain. In the earth enriched by ashes, women will plant yams, plantains, cassava and maize (photo by S. Bahuchet).





for long periods. For example, they can join hunting and fishing camps far away from the villages.

Forest agriculture is "nomadic"; each family opens up a new plot every year (2). Whereas maize, yam and gourds are harvested after less than one year, plantains and cassava may produce for several years. Consequently, each family exploits several plots of different ages simultaneously. The decrease in productivity that accompanies the invasion of the field by sprouting stumps and germinating weeds (3)—originating from the "soil seed bank" made up of wind or animal dispersed seeds—brings about its fairly rapid abandon.

Results obtained from various studies in tropical regions (4), show that this system of shifting cultivation can maintain soil fertility as long as population densities are low, thus allowing plots to lie fallow for at least a dozen years before being reused.

The "home-garden" is an additional and complementary system allowing for a range of food plants, spices and medicinal species to be grown near home, in a limited space. Fruit trees are also intercropped; thus the whole cultivated plant complex reproduces forest diversity on a small scale.

One should measure this diversity, including the yields from different plots, in order to determine what resources are actually available to those populations whose nutritional status is under investigation.



Measuring a Mvae plantation in southern Cameroon and counting species and cultivars along a transect. The usual topographic instruments (topofil, compass and plane table) are used on this particularly irregular land where fallen tree trunks have been left in place. Counting is done along a one-metre-wide band in order not to omit small plants, including spontaneous forms (such as those of the genus *Talinum*) that are edible in the form of "cooked spinach" (photo by S. Bahuchet).

## TECHNIQUES FOR MEASURING

By using a tethered balloon equipped with a radio-controlled gondola—a technique developed to photograph the forest canopy at low altitude in order to analyse its structure (see chapter 1)—we were able to obtain detailed views of home-gardens and those cultivated plots located relatively near the southern Cameroonian villages where we have conducted various food surveys.

Such a technique is most useful in an overall analysis, particularly to reveal the spatial distribution of tree "biovolumes" in home-gardens, and to determine on a larger scale the general disposition of the land, including the location of trails and fields in relation to the various lineage segments.

Identifying and counting species and varieties within a plot needs to be done on the ground. In order to evaluate similarities and differences among cultivation systems belonging to several populations, we have recorded all plants growing inside a narrow transect cutting across each field. By adding a series of transects of randomly chosen fields we have obtained useful mean values to be compared, among various ethnic groups, with our quantitative data on nutrition (chapter 3). Similarly, we have obtained a mean value for local production, by weighing tubers and bunches of plantains at harvest time.

## DIVERSITY OF AGRICULTURAL SYSTEMS

The most typical example of our comparative approach concerns the Lobaye forest, in the Central African Republic, where we studied several ethnic groups close enough spatially and living in the same environment to potentially share the same food resources. Each society has developed its own subsistence strategy, leading to clearly differentiated alimentary systems.

Within the Lobaye forest, the Aka Pygmies (described in the previous chapter) live side by side with four non-Pygmy groups of cultivators, namely the Ngando, Issongo, Monzombo and Ngbaka. The latter, who have been the subject of detailed ethnological studies (5 and 6), maintain close relations of exchange with the Aka. Agricultural strategies differ among the four groups: cassava is the staple of the Monzombo, settled along the Oubangui river; plantain is the principal starch of the Ngbaka, complemented by the periodic use of yams and taros. For the Ngando living further south, in the Lobaye forest, plantains, yams and cassava are of equal importance, whereas for the Issongo, living in the forest fringes, cassava is of primary importance, followed by yams.

By investing with cultural values one or more plant species within their food system (see chapter 5), each of these contiguous groups affirms its own ethnic identity. We have observed the same conceptual contrasts in southern



The Yassa of Southern Cameroon differ from ethnic groups living in the Lobaye forest of the Central African Republic, as well as from the neighbouring Mvae, by practising a quasi-monoculture of cassava. In the field shown, at Ebodié, located near the sea shore on sandy soil, only three cassava cultivars are grown. However, home-gardens increase the diversity by including fruit trees, bananas and plantains, taros and macabos, and the Marantaceae whose leaves are used to wrap certain foods prior to cooking (photo by C.M. Hladik).

Cameroon, between the Mvae and the Yassa. The latter employ a minimum number of cassava cultivars in their fields, while the Mvae maintain a mixture of thirty or so plant species or cultivars, as is the case with the Lobaye forest populations. However, cultural opposition is not always the rule among neighbouring groups. In Zaïre, Pagezy (see below) has observed exactly the reverse, with the Twa maintaining the traditional practices of the Oto.

The utilization of natural resources also reveals divergences between groups: in the Lobaye forest, the Monzombo, a riverine people, are exclusively fishermen; the Ngando and the Issongo hunt with nets and trap game in the forest, whereas the Ngbaka specialize in trapping and using hoop-nets to catch fish in the creeks.

In the Lobaye forest, hoop-nets placed along a dammed creek provide the Ngbaka with small fry. This constitutes an important complement to the food-crops grown in the fields (photo by C.M. Hladik).





Life in forest villages is not exclusively focused on cultivation. Numerous vegetables, condiments and all animal food are provided by the forest itself. Some of the cultivated species considered as "living stock" play an important role since they allow prolonged forays into the forest. Thus all village dwellers together, or sometimes men alone, can spend several months each year in forest encampments, especially at the time when caterpillars can be collected, or when game and fish can be trapped.

## PRODUCTIVE COMPLEMENTARITY

The most noticeable consequence of the various strategies for farming the forest is prolonging production throughout the yearly cycle, thus ensuring a permanent food supply. The lean period, a constant problem all over the dry tropics, does not exist in the forest because there is no single harvest season and very little food storage (chapter 3).

Obviously, this does not eliminate the need for an annual cycle of agricultural work, since cultivators must clear the land and also plant, at appropriate times, short-cycle crops such as groundnuts, gourds and various vegetables.

The great number of varieties that are mixed in the same field allows cultivators to cope with climatic adversities and sundry parasites by distributing risks. Thus the aim is not to maximize yields, but to achieve a sustained production of complementary foods.

Nevertheless, some periods of minimum food availability occur, during which natural forest products are utilized in larger quantities, together with feral species growing in anthropogenic environments.

These extensive subsistence practices are now being carried out in the context of an intensive market economy. Whereas previously the average area cleared was of the order of a quarter of a hectare, chainsaws now allow for easy clearing of one hectare or more, part of the food production being sold for cash.

Local practice still remains basic to these agrosystems, whose future depends on the improvement of cultivated varieties, and on the maintenance of a biological complexity that has proven resilient enough to face the numerous constraints posed by the tropical environment.

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**Facing page:** Cultivated plants providing the staple foods for various ethnic groups inhabiting the Lobaye forest (Central African Republic).

Within a single Ngbaka field (upper left), near Bobélé, nineteen varieties of plantains and, in their shadow, five yam cultivars and three taro varieties are grown in a mixed stand over a recently cleared area of 7,000 m<sup>2</sup>. Such diversity allows for sustained production throughout the year.

The macabo plant (*Xanthosoma sagittifolia*, upper right), of American origin, is cultivated in the home-gardens as well as in the fields; it yields an abundant crop of tuberous rhizomes. Here a young Ngbaka transplants a macabo in the home-garden, at the village of Mettè.

Even though cassava tubers (lower left) make up the bulk of the cultivated products of the Issongo living in Lobaye, yams are a significant element in the cultivation system of the Ngando, their nearest neighbours. The yam (*Dioscorea alata*, lower right), unearthed in a Ngando plantation at Zomia, is a plant of Asiatic origin which, for several centuries, has been cultivated in association with some species of African yams (photos by C. M. Hladik).

