



**A Review of Research on  
Resource Management Systems of  
Cameroon's Forest Zone:  
Foundations and New Horizons**

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**Resource and Crop Management Division  
International Institute of Tropical Agriculture**

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Systems of Cameroon's Forest Zone:  
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## Preface

The Resource and Crop Management Research Monograph series is designed for the wide dissemination of results of research about the resource and crop management problems of smallholder farmers in sub-Saharan Africa, including socioeconomic and policy-related issues. The range of subject matter is intended to contribute to existing knowledge on improved agricultural principles and policies and the effect they have on the sustainability of small-scale food production systems. These monographs summarize results of studies by IITA researchers and their collaborators; they are generally more substantial in content than journal articles.

The monographs are aimed at scientists and researchers within the national agricultural research systems of Africa, the international research community, policy makers, donors, and international development agencies.

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## Acronyms

CERFAP	Centre d'Etudes, de Recherches et de Formation à l'Auto-Promotion
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CPS	Centre de Promotion Sociale (Mbalmayo)
DGRST	General Office for Scientific and Technological Research
ENSA	Ecole Normale Supérieur d' Agronomie
FCFA	Currency used in several Francophone countries including Cameroon
FONADER	Fonds Nationales de Développement Rurale
ICRAF	International Centre for Research and Agroforestry
IDRC	International Development Research Center
IIITA	International Institute of Tropical Agriculture
INADES	Institut Africain pour le Développement Economique et Social
INEAC/INERA	Institut National pour l'Etude Agronomique du Congo/Institut National pour l'Etude et la Recherche Agronomique
IRA	Institut de Recherche Agronomique
IRAT	Institut de recherche agronomique tropicale et des cultures vivrières
MINAGRI	Ministry of Agriculture
NCRE	National Cereals Research and Extension
NGO	non-governmental organization
ORSTOM	Office de la Recherche Scientifique et Technique d'Outre-Mer
PAID	Pan-African Institute for Development
SODECAO	Société de Développement de Cacao
TLU	Testing and Liaison Unit
ZAPI-EST	Zone d'Actions Prioritaires Intégrées de l'Est

## Anthropological terms

<i>afub owondo</i>	mixed crop groundnut field
<i>asan</i>	dry season maize field
<i>bayam-sellam</i>	middle-man
<i>big man</i>	a man who accumulates followers, and goods to distribute/not a chief
<i>clan</i>	descent group tracing common ancestor
<i>esep</i>	high forest field planted with melon and plantain March–April
<i>exogamous</i>	marrying out of group
<i>genealogical depth</i>	number of generations to founder of clan/ lineage
<i>kop</i>	cassava disease
<i>lineage</i>	descent group with common (known) founder
<i>patrilineal</i>	descent in male line
<i>patrilocal</i>	residence after marriage in husband's village, or with his lineage

## I. Theoretical Overview: Changing Concepts of Agricultural Intensification

The International Institute of Tropical Agriculture, particularly the Resource and Crop Management Division, is concerned with understanding how pressures on the resource base shape African farming systems. It is generally acknowledged that pressures of various sorts (demographic, ecological) have increased, production per capita has declined, and productivity remains low, resulting in food deficits (Berry 1984). In theory, this declining productivity can be arrested through adoption of intensive methods such as alley cropping, managed fallows and integrated crop/animal husbandry systems. The humid forest zone faces particular problems, however, as the resource base deteriorates through tree-cutting and declining fallow time.

The introduction of intensive techniques to increase productivity may prove difficult in the forest zone because declining fallow time may be not only the result of increased population pressure—where theoretically labor would be available for intensification—but of changes in land use and shifts in production strategies.

The studies described below will help researchers to understand existing farming systems and transformations in resource management strategies in order to design technologies and combat problems faced by farmers in the humid forest zone of West and Central Africa.

First, it is necessary to examine the concept of intensification. In an extensive system, levels of production are maintained mainly through natural regeneration of the soil by fallowing. Intensification occurs with the employment of additional units of labor and/or capital to maintain or enhance soil fertility on a given unit of land. Intensification implies increasing manipulation of the soil to raise production (e.g., by water in irrigation, by vegetation in mulching, by chemicals in the use of fertilizer).

Intensification does not necessarily bring increased overall labor time, but shifts in tasks and timing of labor inputs. As labor tasks and timing are intricately interwoven into the ecological and social fabric of a community, it is necessary to understand the relations between various elements of the farming system before assessing the viability of intensive techniques.

Many theories have been propounded regarding the origins and causes of agricultural intensification. In early anthropological theory, intensification was seen to prefigure and facilitate population growth and the rise of civilization (Meggers 1954). This conception was challenged by evidence that the Maya civilization of central America was built on an extensive swidden-based (slash and burn) farming system, and research showing that under certain conditions swidden systems could produce a substantial surplus (Dumond 1969). Boserup (1965) turned this theory on its head by arguing that population pressure was the impetus for intensification. Leach (1949) elaborated the theory that intensive and extensive farming methods can be part of the same farming system (in the sense of knowledge available to farmers) depending on relative population pressure. Several case studies in the literature describe a population's shift from intensive to extensive cultivation (Bartlett 1956, Richards 1983, Berry 1984:69). Thus, a transformation from extensive to intensive agriculture is by no means automatic or uniform, and its causes are multifaceted.

Within the general category of swidden, shifting or slash and burn cultivation (extensive agriculture), many patterns have been identified, ranging from systems which border on gathering to highly managed concentric ring systems (Posey and Balée 1989). In many extensive systems, techniques exist for erosion control and conservation of resources as well as for maintaining productivity (mounding, rotation). New crops may be quickly adopted and field types and cropping patterns can change rapidly in response to opportunities and pressures (Vansina 1985).

Research on agrarian change in Africa has uncovered many other factors which shape farming systems in addition to population pressure. These include response to market demand, agricultural policy and investment structures, migration patterns and resultant changes in labor availability, alternate income-generating activities, and the introduction of new crops.

Many attempts have also been made to consciously intensify swidden systems. Since the first heavy-handed schemes to "rationalize" African agriculture, top-down introduction of intensive technology has proved difficult. In their classic work, Jurion and Henry (1969) outlined an ambitious plan for the gradual transformation of "primitive" agriculture through the use of managed fallows. This system was implemented at the *paysannat* Turumbu in Yangambi, in the Belgian Congo, the headquarters of Institut National pour l'Etude Agronomique du Congo (INEAC), now Institut National pour l'Etude et la Recherche Agronomique (INERA), Zaire, beginning in 1945. By 1987, there was not a trace of the intensive system (Mbaya 1980, Russell 1991). More recent schemes to intensify African agriculture have also met with failure, great difficulty, or low adoption rates. These schemes include resettlement to irrigated land, many agroforestry technologies, integrated animal husbandry, and animal traction projects (see Richards 1983: 26).

Since the late 1970s, population growth, decreases in output, and declining productivity have all contributed to the "food crisis" in Africa. Some researchers dispute the magnitude of the crisis, citing the growth in unofficial channels and unregulated crops such as cassava (Guyer 1983), and the unreliability of statistics. Others have focused on policy issues rather than technology. For example, declining production both results from and stimulates food imports.

To cope with the perceived crisis, new analyses of pressures on the resource base and the dynamics of change/intensification are being made. These analyses go beyond the model of "population pressure = intensification" and look at how shifting patterns in the organization of labor, responses to market risks and opportunities, and patterns of investment within farm households contribute to changes in resource management (Berry 1985, Guyer 1984, Henn 1986). These analyses underlie the philosophy that the design and introduction of technologies to combat agronomic problems and enhance soil fertility must be based on a thorough knowledge of the structure and dynamics of existing systems.

Taking the case of the humid forest zone of Cameroon, we will look first at the history of agriculture in the region and at various aspects of resource management. Second, we will discuss the research that has already been carried out in the region on agrarian change, changing resource management strategies and technology introduction. Finally, we will outline further research that needs to be done to facilitate our understanding and to design appropriate technologies. Most of the examples come from the Beti people as they are the largest group in the area and extensive historical research has been done on their agricultural system.

## **II. Background: Geography, Climate and Demography**

The humid forest zone in Cameroon roughly comprises the area below 5° longitude south of the Sanaga and Kadei rivers and the Atlantic coast. There are two types of climate: the Guinean (1,500–2,000 mm rainfall) and the higher rainfall (2,000–10,000mm) Cameroonian type along the coast. Leplaideur (1985) and ICRAF (1986) divide the center-south further into eleven agroclimatological and seven vegetation zones. This monograph cannot do justice to the complexity of farming systems in Southwest and Littoral provinces brought about by the presence of volcanic soils in some areas and proximity to the ocean (see Almy et al. 1989, 1990). The area under consideration thus covers mainly three provinces: Center, excluding the divisions of Mbam and Haute Sanaga, South, excluding the division of Ocean, and East, excluding the divisions of Lom et Djrem and Kadei (Map 1).

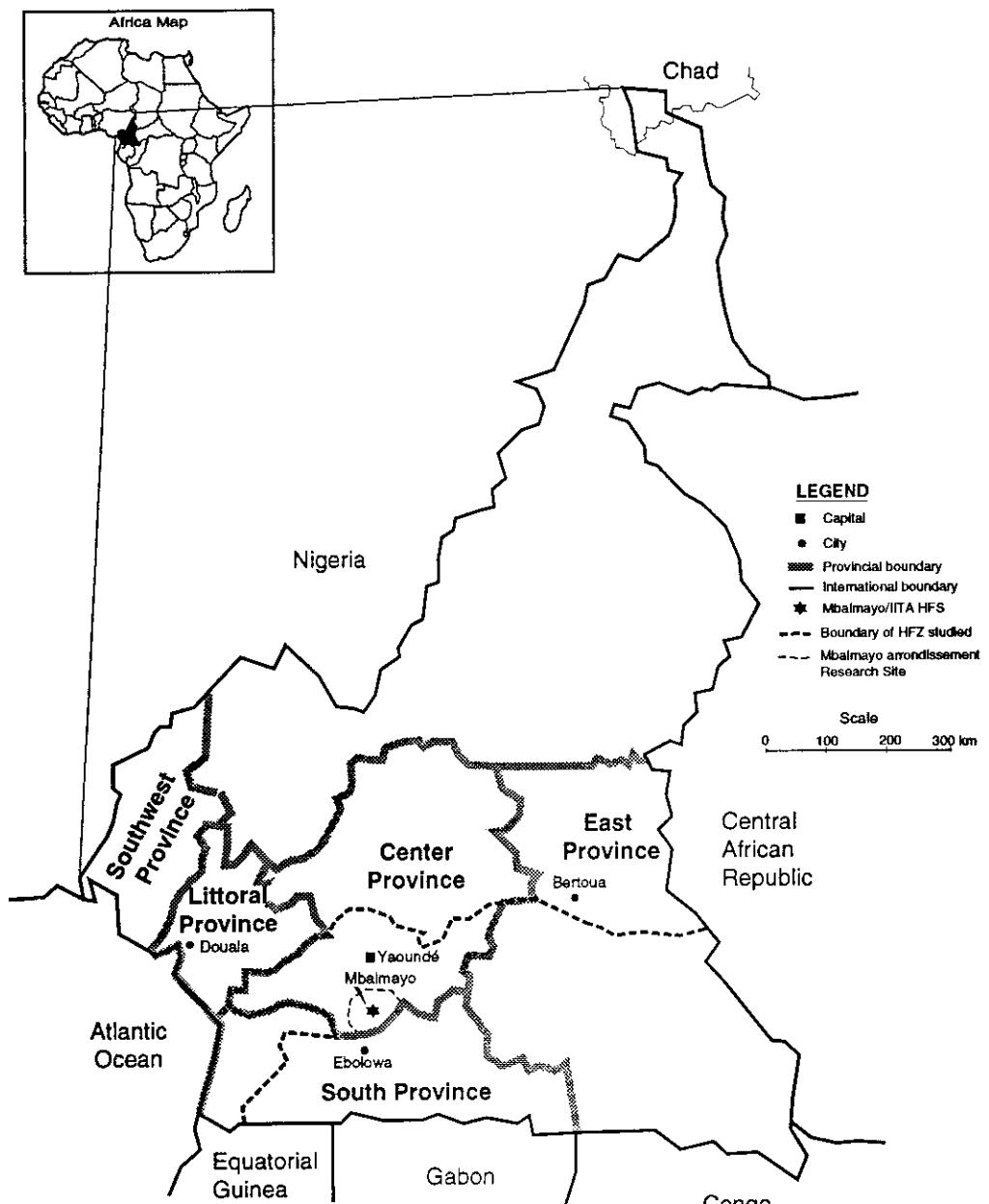
The area has four seasons with regional variations depending on altitude: a major rainy season from September to November, a major dry season from December to mid-March, a minor rainy season from mid-March to June, and a minor dry season from June through mid-August. Vegetation ranges from virgin forest, found only in isolated pockets of the East and South provinces, to gallery forest and mixed forest-savanna, north of Yaoundé.

The humid forest zone can roughly be divided into (relatively) high and low population density zones. The Lékié division, north of Yaoundé, is considered to be a high population density zone (50–100 persons/km<sup>2</sup>) where access to land is restricted, fallows are under four years, and severe soil erosion has taken place (Weber 1977, Guyer 1984, Leplaideur 1985). In the mid-1970s, methods of maintaining soil fertility such as applying manure and fertilizer to vegetable crops were observed (Weber 1977:137).

South of Yaoundé, in the Mbalmayo area which is the site of the IITA's Humid Forest Station (Nyong et So'o division), population density ranges from 13 to 25 persons/km<sup>2</sup>. The (secondary) high forest is gradually disappearing, with fallow times from five to ten years for mixed crop food fields. Farmers report that five years is barely sufficient time to regenerate the forest for good production of cassava, maize and cocoyam. North of Mbalmayo, there is little game left and *Chromolaena odorata* dominates the fallows. In areas south of Mbalmayo, the land pressure situation is unclear, as some villages have serious land conflicts although they are not on major routes and have low population densities (Atangana 1988:11). Within one village, fallow times can range from six to twenty-five years for mixed crop food fields.

### **Ethnic groups and social organization**

The principal peoples of Center province are the Beti (Ewondo, Eton) (Leplaideur 1985, Guyer 1984, Laburthe-Tolra 1981) and the Bassa (Champaud 1973); Ntumu and Beti (Bulu) in the South; numerous smaller ethnicities in the forest zone of the Eastern province such as the Maka studied by Geschière (1982, 1985), the Bobili, the Miezime (Atayi and Knipscheer 1980), the Kaka (Brown et al. 1981), the Bombo, Konambemb and the Bayaka (also called Baka or Babinga pygmies) (Despois 1946). All peoples speak northwestern Bantu languages, including the Bayaka who presumably adopted it from their neighbors.



**Research area, Cameroon.**

These peoples are patrilineal and patrilocal with exogamous clans/patrilineages of varying genealogical depth. Before the implantation of the cocoa economy, the clan played a central role in allocating land and organizing production. Today, a major role of the kinship network is negotiating marriage payments and organizing ceremonies such as funerals, although the two to three generation lineage (*nda bot* in Ewondo) and the clan (*mvog*) still structure access to land in the village. Land registration takes place on only one percent of the land (Weber 1977, Land Tenure Study, forthcoming).

Although big men and chiefs once played an important role in mobilizing labor, especially among the Beti, and slavery was widespread, there was a strong strain of egalitarianism in precolonial southern Cameroon. This was based on the ability of every free man to acquire land, and to provide for himself. This type of social organization contrasts with the more hierarchical societies in the west and north of the country. Nevertheless, the chieftainship is hereditary and, even now, gives the chief privileged access to land and labor.

### **History of agriculture**

Vansina's (1985) history of agriculture in the central African forest zone from the first Bantu migrations to the colonial period provides a starting point for understanding modern farming systems. He confirms the essential unity of western Bantu culture and mode of subsistence in the area which encompasses southern Cameroon, Gabon, southern Central African Republic, Equatorial Guinea, Congo and northern Zaire. The Beti-Bulu-Fang ("Pahouin") group are considered to be the most important and most studied of the northwest Bantu, covering a half million square kilometers (Alexandre 1965:504). Thus, an understanding of the farmers of Mbalmayo, who are Beti (Ewondo), will have broad applications for the African humid forest in terms of cultural homogeneity. As Beti territory ranges from substantially degraded to relatively intact forest, it is also possible to look at the relation between stress on the resource base and changes in institutions, such as the land tenure system, within one culture.

Bantu forest agriculture before 1500 was based on yams, squash or melon (*Cucumerops edulis*), beans, greens such as amaranthus, trees such as the safoutier (*Pachylobus edulis*) and oil palm and other minor crops. The banana revolutionized the system because of its superior yield, its lower labor requirements and flexibility in planting and harvest time. After 1600, plants from the Americas began to spread, the most important being cassava, maize and groundnut. Citrus fruits and pineapples came from Asia. Cassava gained in importance as a prepared food (*batons de manioc*) which was used on trading voyages. Cocoyam did not spread into southern Cameroon until the late 1800s. Vansina notes that, after 1800, specialization took place in the areas of intensive trade and that this specialization brought intensification and simplification of production. He mentions groundnut, the crop most associated with the Beti, as one area of specialization (Vansina 1985:31).

Through the work of Guyer, Laburthe-Tolra, and others, we know quite a lot about precolonial and early colonial agriculture among the Beti. The first Europeans to visit the area around Yaoundé were struck by the vigor and diversity of Beti agriculture and the overall health of the population. Indeed, it is said that the expansion of agriculture into the forest is linked to Beti domination over the former inhabitants, the forest-dwelling pygmies and other groups (Laburthe-Tolra 1981:282). Much of the Bantu migration to southern Cameroon is quite recent. While the Bassa are said to have "always" occupied their territory, at the time of the arrival of the Germans in the 1880s, the Beti were emigrating from the northern savanna-

forest border into the forest towards the sea. The Bassa are assumed to have migrated from the north at a much earlier time.

The precolonial division of labor was based on gender, age and social status (slave, client, noble) with specialization in artisanry, performance, rhetoric, warfare and hunting. Guyer (1984) describes the gender division of labor in farming among the Beti as summed up by the phrase "a man clears, he eats." That is, a man's major agricultural task was to fell the great trees of the high forest for the first planting, that of the *ngon* melon (*Cucumerops edulis*). Men also planted yams, as this consisted of using hard wood sticks to turn over the soil. Anything pertaining to wood was men's work. Other tasks accrued to men as well, including that of determining which part of the forest to clear by the presence of certain trees and plants. Men also possessed the esoteric knowledge, based on the study of astronomy, to plan the agricultural calendar, and they planted fertility herbs in the new fields (Laburthe-Tolra 1981:280).

Women's primary agricultural tasks were seed selection, planting other food crops, soil preparation for yams and sweet potatoes, weeding, harvesting and transportation of crops. A wife was allocated land through her husband's clan and she was responsible for meeting the food needs of her husband and children. Responsibility for feeding the husband and his guests was rotated among wives in polygynous households (Vincente 1976).

In the early colonial era, Europeans requisitioned food from chiefs, enabling some chiefs to set up large plantations using the labor of numerous wives. This system broke down with the establishment of cocoa as essentially a smallholder crop and the diminution of the power of the chiefs (Guyer 1984). Cocoa dramatically reshaped southern Cameroon's farming systems. While formerly men were primarily warriors and hunters, they became cocoa planters. Villages were relocated along the road, and land for cocoa plantations was passed on individually rather than as part of a clan's heritage. Village migration for new land no longer took place (Weber 1977). The extraction of surplus value from cocoa farmers through fixed prices and monopsonies became a major source of revenue for the state. Structures of marketing, extension, and provisioning were set up which have had a profound effect on center-south Cameroon. The creation of a food market changed production strategies as well, including specialization in vegetable crops, and the intensification of cassava and plantain production, especially north of Yaoundé.

Until recently, agricultural extension work was primarily carried out by the parastatal Société de Développement de Cacao (SODECAO). This work was facilitated by the creation of Centres de Coupage in major villages for the collection of cocoa and marketing of other crops in addition to extension work on cocoa and distribution of inputs. In the last few years of its existence, SODECAO also did extension work with food crops and cooperatives were set up to sell cocoa. SODECAO subsidized inputs and tools or gave them to farmers outright. This approach has led to unrealistic expectations, lack of experience with the market and stunted community development, according to community development planners interviewed from both the government sector and non-governmental organizations (NGOs). Department of Agriculture officials interviewed in Mbalmayo in 1991 remarked that SODECAO's predominance left them very few resources to offer farmers. The restructuring of SODECAO beginning in 1988, the decline in cocoa prices, and the attraction of men to food farming have affected resource management strategies, as discussed in more detail below.

Development efforts are now fragmented. In 1991, four private firms were given the right to buy cocoa in Nyong et So'o division. NGOs such as Centre d' études, de recherches et de formation à l'auto-promotion (CERFAP), Centre de promotion sociale (Mbalmayo) (CPS) and Institut africain pour le développement économique et sociale (INADES), have been involved in organizing extension activities and general rural development programs in conjunction with the governmental organizations for community development and women's issues. The Institut de recherche agronomique (IRA) has several experimental field sites organized by the Nkolbisson Testing and Liaison Unit (TLU). At the village level, women's groups are organized to accomplish a variety of tasks, including facilitating extension and commercialization, but these groups operate on a very small scale (Atangana 1988). Groups of men or mixed groups (*équipes*) may also work together for a season on a communal field, or exchange labor.

### Resource management

Among the Beti, the major field types are the high forest field, called (in Ewondo) *esep*, which is planted in March-April with melon, cocoyam and plantain, the mixed crop groundnut field (groundnut, cassava, maize, cocoyam) called *afub owondo*, planted in either season, and the dry season field grown in marshy areas called *asan*. Green vegetables are grown on the places in the field where ashes accumulate after burning trees, as these are seen to be particularly fertile areas. Mounding is only done on yams, cocoyam~~s~~, and sweet potatoes; in some villages only by a few older women. No other soil management techniques are used. The *esep* field will later become a groundnut field or fields (*afub owondo esep* or *afub owondo oyen* depending on season). Guyer (1984) discusses other types of small food fields such as specialized sweet potato and yam fields. These fields are found more in the Lékié division than elsewhere. Rice has also been cultivated in marshy areas (*afub oles*) but this is no longer common.

According to farmers interviewed in the Mbalmayo area, various trees and plants indicate or enhance soil fertility in different types of fields while others may be at the same time beneficial and harmful (e.g., they may retain moisture in the dry season but contribute to tree rot in the rainy season, or harbor caterpillars which eat the crops). Cultivation is avoided near trees with extensive root networks or those deemed very "hard" (e.g., the *elone* or *Erythrophyleum suaveoleus*). A study is being made which catalogues indicator trees and describes the precise environment in which these trees are said to be "good" or "bad" for soil fertility, as this evaluation can change depending on field type and crop. Other trees have medicinal value, value for housebuilding, furniture, firewood and charcoal in addition to their role in the cropping system (see Duguma et al. 1990).

Trees, including cocoa trees, are protected by the government and it is forbidden to cut them without a permit for exploitation (with certain exceptions). The Department of Agriculture Annual Report for 1989/90 of the Nyong et So'o division notes that many of these permits have expired and much unlicensed cutting goes on in the region. It is common for farmers to cut all or almost all of the trees to make an *esep*, even if they know it is "wrong" to do so, because they say that leaving trees in the field attracts pests. Westphal attributes this method of cultivation to the fact that the Beti migrated to the forest in the recent past from the forest/savanna border. In adapting to the forest, they had to plant their groundnut fields after the *ngon* cycle. He says, "The consequences of these modifications on

the reestablishment of the forest in the fallow period were disastrous, as all the trees were felled and the field had to be burned a second time" (1981: 51; my translation). Vansina (1985) finds that the cultivation of groundnut fields in two seasons is not a transmutation from a savanna-forest system but an intensification of the forest system for specialization. In the cocoa plantations, many shade trees are spared, however. Chainsaws were introduced in the 1980s but their impact has yet to be thoroughly researched.

### **III. Research on the Forest Zone of Cameroon and Gaps in the Research**

While there have been several studies of farming systems in southern Cameroon, gaps exist both in terms of areas inadequately studied, understanding of pressures on the resource base, and farmers' strategies. An annotated bibliography of seventeen works on *farming systems* in southern Cameroon is presented in the annex, thus this discussion will not detail each study.

The two major areas which have been insufficiently studied are the east (especially the southeast) and the southwest. These areas are presumed to have relatively low population densities with relatively intact resource bases, although one can hypothesize that timber exploitation, plantation and concession areas, and migration differentially affect the resource base even in "isolated" areas.

Much of the research (e.g., Marticou, Weber, Westphal, Guyer, Mutsaers) was carried out twenty years ago—since then Yaoundé has grown from a city of 200,000 to over 800,000 people. Other studies are so localized that one cannot use them for characterization of farming systems in the region (for example, Champaud on the village of Mom, and Tissandier on the village of Zengoaga). These intensive studies are very useful, however, for an understanding of system dynamics. Those studies which encompass a wide area (e.g., Westphal, Marticou, Weber, Leplaideur, Atayi and Knipscheer) were structured around specific topics (classification of cultigens—Westphal; changes in land tenure—Weber; food self-sufficiency—Leplaideur; and evaluation of the impact of development projects—Atayi and Knipscheer).

A great deal of information can be culled from past research, however, which provide a firm foundation for the refinement of theories on intensification and other responses to pressures on the resource base. To simplify the discussion, the issues covered by the research have been divided into six categories: characterization of the resource base and farming systems, changes in land use, labor patterns, technological change, investment patterns, and changes in social and economic structures. We will look first at the data available and then analyze gaps in these data.

Characterization of the resource base is most elaborated in studies by Westphal, Marticou and Leplaideur, the latter two limited to center-south Cameroon. In addition, the Duguma and Depommier studies characterized farming systems and tree resources in two divisions of the Center province. The Westphal study deals with all Cameroon and identifies important cultigens for each farming system. Leplaideur presents a variety of classifications of farming systems, including different types of crops and fields, specializations, integration into the market economy, and tendency toward intensification. These classifications are aggregated at the divisional level.

Research on changes in land use has focused on:

1. Intensification;
2. Changes in field types and cropping patterns;
3. Changes in land tenure systems.

Much of the research on the effect of population pressure on land use is centered on the Lékié division north of Yaoundé, and some studies compare villages in the Lékié with

villages south of the city (Ay, Duguma et al., Depommier et al., Leplaideur). For example, the creation of specialized fields for vegetable production and the use of fertilizer have been reported in Lékié.

Changes in field types and cropping patterns may or may not indicate an intensification of production. Guyer describes how the *esep* field became less important in the Beti farming system as male labor input for clearing the forest diminished. While Leplaideur and Ay report the use of chainsaws to clear the forest, we do not know whether that has facilitated the reemergence of this type of field, or more intense exploitation of the forest in general. In addition, we do not know what impact the fiscal crisis of the last few years has had on ability to rent or purchase chainsaws.

Weber's study details changes in the land tenure system which came about from the development of cocoa. While we know that the state has—until now unsuccessfully—attempted to wrest control of land allocation from the traditional chiefs, we do not fully understand the continuing role of the clan in land acquisition by strangers and how this may change with new opportunities, risks, and population shifts. Further, there has been little research on differences between strangers and locals in use of land. The Land Tenure Study prepared by IRA, ILCA, and the Wisconsin Land Tenure Center (forthcoming) deals with differences in tenure in relation to potential adoption of agroforestry techniques. Policies such as the Young Farmers' Resettlement Program and other land registration programs which could have an effect on differential access to land have not yet been looked at for the center-south (cf. Goheen 1991).

Changes in labor patterns can be studied through research into

1. General organization of agricultural labor at the village level;
2. Changes in the division of labor; and
3. Development of a labor market.

Research on the organization of labor has focused mainly on the gender division of labor. Some mention is made of work groups, but there have been few detailed studies of work groups or differential access to labor (see Jones 1983 for northern Cameroon, Geschière 1985 for the Maka). The chapter on agricultural labor in Leplaideur's study concerns farm households' strategies for obtaining adequate labor. The utility of his analysis is diminished by the fact that data are aggregated by division and the household is seen as a single unit (*unité de production paysanne*).

Guyer discusses changes in the gender division of labor under the general theme that there is no "natural" division of labor; women can work on cash crops and cereals and men on food crops (Guyer 1983). The division of labor varies according to changes in demography, demand for different crops, and through struggle and negotiation (cf. Vincente 1976 and Jones 1983). Henn describes the intensification of women's labor for increased commercialization in two villages. Very little is known about the development of a labor market, including availability of labor, compensation, categories of work, types of people using hired labor, and the role of hired labor in the rural economy (see ICRAF 1986:36). In addition, no studies were found on the impact of universal education on labor availability. The difference in labor markets for different tasks (clearing, weeding) also needs to be researched.

The introduction and adoption of new technology, including improved crop varieties, are specifically covered in the IITA/General Office for Scientific and Technological Research (DGRST)/World Bank report on the Eastern province, as well as in N'Sangou Arouna's report. These studies also discuss the role of extension in the adoption of technology under the ZAPI-EST development scheme. Leplaideur's work is geared toward helping SODECAO plan development work in their area. Extension of food crop seeds, tools and inputs was provided to a number of women's groups in the SODECAO area, including the distribution of maize seeds and plantain varieties developed by IRA, but few (if any) studies are available on the impact of SODECAO extension efforts on food crop production. Information on these activities has been obtained through interviews with ex-SODECAO agents in charge of food crops and a review of internal documents for the organization.

In addition to the allocation of land and labor, farmers also allocate capital for agriculture and other purposes. Investment here signifies the allocation of revenue for specific ends and thus has a broader meaning than that used in economics. It should not be assumed that revenue from agriculture is reinvested in agriculture (Berry 1984). Many studies look at how farmers obtain revenue (including from non-farm sources) but very few are able to examine the extent to which revenue is invested in agriculture or in other enterprises (e.g., house-building, education). Farmers' investment strategies can reveal attitudes about farming and constraints to development which have implications for technology design. For example, some people may feel the immediate need to finance their children's education and will forgo new technology that might eventually increase their incomes. Others are not accustomed to spending money on farming as land and family labor are "free" and tools are very inexpensive.

The gender or age of the person investing is significant as well: a man might invest in a chainsaw for clearing the forest whereas a woman would prefer a mill for processing food. A young man might work a season with other young men to accumulate a sum for a specific purpose, while older people with children need steady revenue to pay school fees.

Leplaideur shows how people obtain income from both *farming and other sources*. Henn discusses the difference between women's and men's opportunities for, and constraints to, obtaining revenue from sale of crops. Neither looks at the use of agricultural surplus. Some research has been done on the conditions under which farmers will buy inputs but differentiation among households in access to revenue and investment strategies has been little studied for the area (cf. Hill 1977, Parkin 1972). Constraints on hiring labor may actually protect resources, as many farmers interviewed in the Mbalmayo area claimed that they would clear much larger areas if they had the means to do so.

Agriculture is a human activity and as such is embedded within a social system comprising rules and institutions. Some rules and institutions directly govern use of land, labor and capital for farming, while others, such as social control mechanisms, indirectly, though often strongly, affect the use of resources. While the former concerns are addressed through studies of land tenure, organization of labor and investment as described above, the latter influences are often given short shrift if they are addressed at all in farming systems studies.

Anthropologists have studied the relation of ritual and belief systems to the regulation of resource exploitation (e.g., Rappaport 1968). Laburthe-Tolra showed how the division of labor was reflected not just in tasks but in access to magic which assured soil fertility and good production (cf. Godelier 1988). Vincente discussed how conversion to Christianity transformed the polygyny-based production system among the Beti. Migration from rural

areas is said to be, in part, the result of conflicts over land and authority which create fear of sorcery among the young who are most vulnerable. Sorcery threats can also impede collective work and inhibit entrepreneurs and locals from investing in their own village (Voix du Paysan 1990). On the other hand, one informant mentioned that sorcerers' magic is based in the old and large forest trees; as such their power is destroyed when these trees are cut down. Perhaps the threat of sorcery can actually serve to protect resources.

It is important also to look at social institutions which facilitate cooperative work, including religious groups, NGOs and diverse village organizations. The extent to which these groups are loci of investment, and the type of investment made, are significant for technology design. Examining the causes of the dissolution of cooperative efforts leads to an understanding of the limits to productive investment. These issues are hardly touched upon in the farming systems literature.

Finally, one must study the wider economy within which households and communities allocate and manage resources. Several of the works discuss the role of markets in shaping farmers' strategies, including the consequences of differential access to markets, changes in price, market structure and demand (Guyer, Henn, Leplaideur, Atayi and Knipscheer). Recent work in other countries suggests that economic chaos and instability lead to diversification rather than the specialization one would expect from increased integration into the market (Berry 1989, Russell 1991). For example, some farmers interviewed in the Mbalmayo area planted large fields of plantain in the last couple of years only to have the price drop steeply. They now say that they will plant "a little of everything" because they have no idea what might prove profitable.

In brief, significant gaps in our knowledge of resource management systems in Cameroon's humid forest center on:

1. Changes in inheritance and other factors shaping access to and use of land;
2. Work groups, labor availability and labor markets for different tasks;
3. Investment strategies;
4. Differences among farmers in terms of access to land, labor and capital;
5. Knowledge systems and resource use, especially in relation to trees; and
6. Current changes in market structure and their impact on resource use.

#### IV. Recent Trends in the Mbalmayo Area and Proposed Research

One of the most important trends of the last few years is the drastic fall in cocoa prices and the restructuring of the cocoa development organization (SODECAO). Farmers north of Mbalmayo claimed that the price of cocoa fell from 450 to 150 FCFA the kilo from 1988 to 1990 (1991 price: 220 FCFA for Grades A and B). In addition, department of agriculture officials report that the resulting chaos in the market structure has led to traders imposing prices on producers and even tricking them with rigged scales. This practice dates back to the colonial era but was curtailed under SODECAO (see Boto 1971). There has also been a great deal of flux in food crop prices: farmers say that in 1991 the price of a sack of cassava dropped from 4,000 to 1,000 FCFA due to a surplus on the market. This surplus may have come about from a department of agriculture plan to increase production by encouraging large fields. Also, large fields are the result of farmers' strategies to combat declining income by growing more food for sale.

Key informants and village level interviews in five villages give some indication of the types of problems faced by farmers. The major agronomic problems reported are:

1. The rapid spread of *Chromolaena odorata* which invades a food field after harvest of groundnut and maize. Farmers feel that this weed negatively affects soil fertility. The only way to get rid of it is to burn it, they say.
2. Red ants which attack cassava tubers (and apparently infest other crops as well) causing them to rot (*kop*). Farmers claim that this problem has increased and that it affects all types of fields. They have no solution for it. Leplaideur also identified these as major agronomic problems, with crop destruction by animals and birds the most serious overall problem.
3. In terms of field preparation, farmers identified problems of clearing (difficulty of clearing and deforestation from clearing) and tilling as the most important. A local agronomist reported that tilling problems may come about because people now till in the dry season when children's labor is available, as opposed to waiting until the first rains when the ground is softer.

Four villages have been identified as sites for research. In one village north of Mbalmayo, the forest is diminishing to the extent that people are worried about soil fertility. They seem to have modified the crop mixture or rotation of the *esep* field. The first cycle was traditionally reserved for *ngon* melon, but now plantain may be planted exclusively as a first crop. Some men have neglected their cocoa fields and are trying out fruit trees such as orange, mango and guava, and fruits such as pineapples. One woman has a small business making guava jam which she sells in Yaoundé during the season (October). The chief grows oranges but claims that he is unable to buy pesticides so much of the fruit is infested with insects. He reported that, in his observation, more people were returning to the village than leaving it because opportunities in the city had dried up. The local development group had raised 700,000 FCFA to build a meeting house but have made no purchases of communal facilities for processing agricultural products (such as cassava or maize mills) and all processing is artisanal.

In another village distant from urban centers, farmers are unable to get improved seeds, inputs and advice on either cocoa and food crops. Here the farmers say that they have enough land but their food fields are up to four km from the village. Men often clear fields at the limit of their territory to guard against encroachment. Transport is difficult during the rainy season, and only two bush taxis travel to the village, which is large and on the way to becoming an administrative center. As SODECAO is no longer maintaining the roads, the village is becoming more isolated.

A third village is on the newly rehabilitated road from Mbalmayo to Ebolowa. It is the site of a now defunct sawmill. Villagers never depended on cocoa as they grew and sold food to sawmill workers, cocoa farmers and travelers. When the sawmill closed and food prices declined, they were forced to grow more food and market it themselves in urban areas. The disappearance of wild foods such as mushrooms and caterpillars, perhaps brought about by fungicides and pesticides introduced by SODECAO, has provoked much concern.

The most isolated village is on a dead end road travelled only by a few *bayam-sellem* food traders. Despite its isolation, land pressure has intensified. Women here complain that they are now competing for land with young, unmarried men who are cutting forest to make *esep* fields. Formerly only married men could make an *esep* but now unmarried men have taken up cultivation of maize, yam and sugarcane for sale. Shortage of labor means that people "work like elephants" and women must now leave the village to sell food in town. Women are no longer able to care for their fields as they did fifty years ago, when it was reported that mounding and mulching were commonly practiced.

The decline in cocoa prices and overall economic decline seem to have limited farmers' ability to compensate labor to clear fields, and few can now buy inputs. The reorganization of SODECAO will involve an attempt to intensify the formation of farmer cooperatives because SODECAO will phase out its role in extension and provision of inputs. Since FONADER is bankrupt, it is unknown what type of credit, if any, will be available to farmers.

In sum, farmers in the Mbalmayo area seem to have responded to recent events by turning to food crops which can be sold in the cities and towns, especially increasing the cultivation of plantain and cocoyam. This shift has been carried out within the context of an overall decline in availability of inputs, credit and cash to compensate labor. Increased production has not involved the use of intensive methods, but only an enlarging of the field size and increasing the numbers of fields, including interseason plantings. Communal fields exist only to fund specific projects and men like to clear large areas for their own use as the land they clear can be passed on to their children. This increased production has not led to increased revenue, however, because farmgate prices have declined. Farmers are not necessarily investing what capital they have in either production or transformation of crops, but men may be increasing their labor time on food crops.

As forest land is being more intensively exploited for food fields, land conflicts are increasing, especially when outsiders, urban dwellers, and groups of young men attempt to use land that has been under the control of elders. Cocoa plantations still play a major role in the village political economy because a plantation cannot be alienated from the individual who planted it, whereas fallows can be redistributed. Owning a cocoa plantation and being a "planter" also gives a man status in the village.

Changes in the gender division of labor are taking place and this may have implications for women's access to resources. As food crops gain in importance, men are saying that women now have more purchasing power than men do. Women's groups of various kinds

have become the dynamic force of the community. On the other hand, as men become more involved in food crop production, they infringe on women's only means of acquiring income and feeding their families.

## **Further research**

To intervene in a farming system, one must pose five basic questions:

1. What resources will the technology require, both natural resources and human resources such as land (tenure system), labor, and capital?
2. What type of knowledge does it entail?
3. How will the knowledge be transmitted and the work carried out (e.g., individually, in groups, by men or women)?
4. How does it fit into the rhythms of life and the particular historical situation of the people (e.g., seasonal patterns of work, levels of migration)?
5. Will it help in the aggregate, considering such factors as access to markets for increased production?

As Berry puts it, "Environmental conditions define some of the parameters within which cultivation must take place, but the development of more productive systems of agriculture depends on how people exploit their environment as well as on the original properties of the soil" (1984:68). It is thus necessary to integrate an understanding of the culture, society and history of the farmers into technology development. By culture, anthropologists mean the assembly of rules and meanings (including the knowledge system) by which people order their lives. By society, we mean the institutions which embody these rules. History is contrasted with evolution which is seen to operate through laws (population pressure leads to intensification which in turn leads to stratification and specialization). Anthropologists, like other scientists, are now grappling with stochastic processes and complex multivariate causality (systemic as opposed to linear change). It has become a primary challenge to model complex interactions and patterns of change in order to understand farmers' decisions (Guyer 1988).

In the resource management survey work (Dvorak 1990), IITA is categorizing pressures on the resource base, responses by farmers and other perturbations which shape resource management systems. The survey will provide data on all vegetation zones in Cameroon, and will be expanded to cover forest zones in west and central Africa. It identifies field types, management practices, fallow vegetation, husbandry practices, important crops and their uses as well as looking at factors such as market access, village size and structure, restrictions on land, the labor market and consumption patterns. One issue that has already emerged from the work in Nigeria is the importance of understanding the way farmers categorize and differentiate their fields and fallows, and how this categorization changes over time and space.

An anthropological study is also being carried out which looks at the interaction of culture (farmers' perceptions and worldview), society (institutions) and history (events and developments internal and external to the community) in shaping resource management systems. Through an intensive study we can understand differences among individual farmers

and analyze why certain changes take place. At this point we can begin to fit technology development into the practices and processes which make up the resource management system.

While the particular social institutions of one farming system may differentiate it from another, it is possible to use a case study approach to illustrate the ways in which institutions facilitate access to and mobilization of resources for agricultural production in a wider area, especially if this is bolstered by survey and bibliographic research.

The study models the resource management system in such a way as to show how specific technologies fit into social systems. For example, continuance of a soil management practice such as mounding for sweet potatoes is the result of an interaction of the knowledge system of older women, quality of the resource (soil), the demand for sweet potatoes, and the labor available. The types of trees which are cut or saved as fields are prepared may depend on the type of person cutting, his age and experience, the laws governing tree-cutting, specific market factors, and beliefs about the properties of trees. For initial findings from the study in four Mbalmayo villages, refer to Research Report (Russell, December 1991).

One aspect of the farming system which needs more study is the process of innovation and diffusion. The standard model for technology development is to identify a problem, develop technologies on station, test on farm and diffuse through extension. Most diffusion of varieties and techniques, however, comes from farmer interaction. For example, in one area near Mbalmayo, many farmers are experimenting with pineapple fields largely due to the success of a (self-taught) farmer who has developed a five hectare pineapple plantation and sells cuttings to his neighbors.

Given the financial constraints of most African countries, it is unlikely that extension services will be able to diffuse technologies for fallow management, which are complex and require long-term planning. Nevertheless, farmers may adopt or try techniques, especially those which are multipurpose (weed control, enhanced fertility, useful plants or trees). It might not be an exaggeration to say that technologies that cannot be diffused by farmer interaction are likely to remain models for the station. Thus, two very important avenues of future research are the diffusion of technology and innovation at the farm level, and scientist-farmer interaction in the development of technology.

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## **Annex**

### **Annotated Bibliography: Works on Cameroon Farming Systems with Reference to Resource Management in the Humid Forest Zone**

#### **A. Cameroon-wide studies**

1. Title: L'agriculture autochtone au Cameroun. Les techniques culturales, les séquences de culture, les plantes alimentaires et leur consommation

Author(s): E. Westphal et al.

Date: 1981 (surveys 1975–1979)

Source: Miscellaneous Papers 20 (1981). Landbouwhogeschool Wageningen, the Netherlands. H. Veenman and Zonen B.V. Wageningen. IITA library.

Survey location: a series of surveys in four regions of the country: forest, "postforest," the western plateau, northern Cameroon and mountain people of Mount Mandara and their cultivation of the plains; collection of food crops in 40 markets.

Extent (no. of respondents): no specific information given

Main topics covered: soils, vegetation; farming techniques

Other topics: established a collection of food plants found in gardens, markets and fields and in experimental garden at Ecole normale supérieure d'Agronomie; climatological data; ethnicities.

Other sources of data: complete bibliographic research on botany and nutrition; results of national survey on nutrition (1977/78).

Bibliography: included

Topics: botany, nutrition

No. of items in bibliography: approximately 180

Comments: Page 52, discussion of intensification of swidden systems. Has an index of subjects and scientific names of plants. Page 23 has a table of agricultural terminology in French and English.

#### **B. Center-South Cameroon**

1. Les structures agricoles du Centre-Sud Cameroun by H. Marticou (1962) is considered to be the classic work on farming systems in the region, but a copy has not been located. Published by the Secretariat au développement rural, Yaoundé.

2. Title: *Les systèmes agricoles en zone forestière: paysans du centre et du sud Cameroun*

Author: A. Leplaideur

Date: 1985 (1975/1978, six months in 1983)

Source: IRAT/CIRAD, Montpellier, France. IITA library

Survey locations: Center and Southern Cameroon

Extent (no. of respondents): first study in three villages (Niga, Ekali, Nkolngui) two researchers lived in each village for three years; second study consisted of 360 "UPPs" (unités de production paysanne) in the former SODECAO zone (180 researchers made successive visits of three days/year over a three year time period); third survey in 1983 covered a different area including zones north of Yaoundé as well (216 men and 216 women (432 UPPs) in 72 villages (8 divisions).

Topics covered: as summarized in the introduction (my translation): "The peasants of central and southern Cameroon: Their living conditions, their diet, their revenue. Their farming system. The bases of their strategies for food crop production. Their technical and economic expectations. Their mode of production—tools, labor, land—in the wake of development. The weight of history on the management of land tenure and the organization of work. Two big problems: sufficient supply for the demand and rural exodus. A hand stretched out to national researchers and developers: take into account the reality [presented here] to plan development strategies and use of models." Other topics: extensive bibliographic research.

Other sources of data: everything that had been written about Cameroon farming systems to date (at least in French).

Bibliography: included

Topics: general Cameroon, natural environment: soils, climate vegetation, development, agriculture for both Cameroon in general and Center/South in particular.

No. of items in bibliography: 264

Comments: This work is too large to allow a summary of all the topics, tables and subjects broached. Of specific importance to the study of fallow management, see Chapter Two (farming systems). Finds that *Chromolaena odorata* will not be accepted by farmers as green manure.

3. Title: *Structures agraires et évolution des milieux ruraux: le cas de la région cacaoyère du centre-sud Cameroun*

Author: Weber J.

Date: 1977

Source: ORSTOM

Survey location: villages of Yemesoa and Alen-Zalengang (Dja-et-Lobo)

**Extent (number of respondents):** unsure, uses Marticou data

**Topics covered:** revenue, food purchases, plantation size, migration and age, budgets

**Other sources of data:** history of Beti people

**Bibliography:** included

**Topics:** land tenure, history of the region

**No. of items in bibliography:** 49

**Comments:** discussion of field types, land tenure system of the past and present including conflicts, land borrowing and sale.

**4. Title:** Diagnostic Survey on Local Multipurpose Trees/Shrubs, Fallow Systems and Livestock in Southern Cameroon

**Author:** Bahiru Duguma, J. Tonye and D. Depommier

**Date:** September 1990 (Survey, December 1987)

**Source:** ICRAF Working Paper No. 60

**Survey location:** Lékié and Dja-et-Lobo

**Extent (number of respondents):** 56 households for Dja-et-Lobo (four cantons) and 100 households for Lékié (each canton) chosen randomly. Thus .25 of farm population. One individual from each household was interviewed regardless of gender (but 80% of the respondents were male).

**Topics covered:** goal of the survey was to determine what factors the farmers consider in deciding whether to bring a particular piece of fallow land under cultivation. Importance of indicator trees, management of livestock, techniques to improve soil fertility, inventory of multipurpose trees and shrubs crosstabulated as indicators of soil fertility.

**Other topics covered:** None

**Other sources of data:** Leplaideur and IRA/IITA/IDRC study

**Bibliography:** included

**No. of items:** 2 (cited above, i.e., Leplaideur and IRA/IITA/IDRC study)

**Comments:** useful table of multipurpose trees and shrubs correlated with soil fertility. Some trees seen by some farmers as indicating high fertility and by others as indicating low fertility. Livestock management found to be a problem, with many farmers unfamiliar with browse plants.

**5. Title:** Utilisation du sol et potentiel agroforestier dans le système cacaoyer et cultures vivrières du plateau sud-Camerounais: cas de la Lékié et du Dja-et-Lobo.

Authors: Depommier, J. (ed.) (with five other authors from IRA and four from ICRAF)

Date: November 1986

Source: IRA

Survey location: Lékié and Dja-et-Lobo

Extent (number of respondents): 29 farm households (8 from Dja-et-Lobo (two arrondissements) and 21 in Lékié (four arrondissements). Selected by agricultural officers based on a range of household types including landholders, smallholders, and sharecroppers.

Topics covered: household organization, cash strategies and labor use. Food crop production, cocoa production, home gardens and small stock systems.

Other topics covered: none

Other sources of data: Leplaideur

Bibliography: none

Comments: About 18% of farms operated by women; breakdown of the gender division of labor in Lékié. Improved fallow is a good start to introduce new techniques (some trees can much more easily be cleared). Key variable is labor, thus management systems should have minimal cultivation requirements (problem for alley cropping). New tools could increase labor productivity. Labor constraint in tethering and feeding animals. Technologies for dealing with declining soil fertility have not been found as forest fallowing is becoming more difficult. Recommend exploring native and naturalized trees for soil fertility improvement. One interesting observation was that "despite the high population density and the practice of stock confining[,] homegardens are much less developed in Lékié than in Dja-et-Lobo" (p. 20). Species diversity and fencing were more advanced in Dja-et-Lobo.

### C. East Cameroon

1. Title: Enquête sur les systèmes d'exploitation des cultures vivrières dans les Zones d'actions prioritaires intégrées de l'Est (ZAPI-EST) du Cameroun

Author(s): E. A. Atayi and H.C. Knipscheer

Date: 1980

Source: IITA/ONAREST. IITA library

Survey location: Eastern Province, four locations: Diang Belabo, Nguelemendouka, Angossas, Doumé, Mbang (location of ZAPI)

Extent (no. of respondents): from 72 villages, 216 families — 432 individuals, (man and his first wife) chosen at random

Topics covered: demography of population; types of land; types of soil; types of crops according to soil types; length of fallow; agricultural calendar; soil preparation; yields; staple foods; capital and credit; revenue and expenses; reasons for crop failures; motivation and decision-making; consumption and production figures

Other topics covered: market structure pricing and measures

Other sources of data: climatological

Bibliography: none

Comments: Has many of the components of farming systems research and is wide-ranging. One conclusion reached is that with the present price and market structure, the farmers' revenue is so poor that they cannot afford to adopt innovations.

2. Title: The Marketing of Food Crops in the Eastern Province of Cameroon

Author(s): E. A. Atayi and H.C. Knipscheer

Date: 1980

Source: Discussion Paper No. 11. IITA, Agricultural Economics. IITA library

Survey location: ZAPI zone (eastern Cameroon)

Extent (no. of respondents): 4 markets extensively (rural and urban) and 7 others less extensively (some are periodic occasional markets)

Topics covered: market chain or circuit, volume, quantity, value and proportion of food crops sold, market functions, transport, pricing measures

Comments: government controlled prices are lower than producer prices; markets dominated by *bayam-sellams*

3. Title: Terminal Report World Bank/IITA/DRGST/Cameroun.

Farming System Research Project in Eastern Cameroon

Author(s):

Date: 1983 (field trials 1979-82)

Source: IITA library

Survey location: eastern Cameroon

Extent (no. of respondents): n/a

Topics covered: field trials on varieties, effects of fertilizer, plant densities, land and crop residues management, crop rotation, date of planting, weed control, disease, intercropping systems (groundnut, maize, sweet potato, cowpeas, cassava, lowland rice), potential for crops based on soil, rainfall and solar radiation characteristics.

Other sources of data: none

Bibliography: included

Topic: soils

No. of items: 34

Comments: According to this study, there are already "a considerable number of studies on land and soils, vegetation and hydrology of the province." These data are available at the Department of Meteorology of the Ministry of Transport at Bertoua. Table characterizes different agro-climates in the region and lists potentials and constraints to food crop development. Finds that farmers' income is low because field size is too small and yields are low. Nevertheless, the area has good potential for food crop production (now neglected in favor of cash crops).

4. Title: Evaluation économique des systèmes de culture dans l'est Cameroun

Author: N'Sangou Arouna

Date: 1984

Source: USAID library

Survey location: Eastern province, villages of Doummendouka, Angossas, Diang, Bilabo, Mbang, Badongou

Extent (number of respondents): unknown

Topics covered: effects of new techniques on farming system, reasons for persistence of mixed cropping, reasons for nonadoption of improved seeds and planting materials

Other sources of data: Atayi, other studies of Zone d' Actions Prioritaires Intégrées de l'Est.

Bibliography: none

Comments: table of fallow times related to type of field (plateau, hill, valley), table of soil preparation methods used, measures to combat crop failure, reasons given for crop failure.

## D. Yaoundé area

1. Title: Family and Farm in Southern Cameroon

Author(s): Jane Guyer

Date: 1984 (data from mid-1970s)

Source: Boston University African Studies Center, African Research Studies No. 15

Survey location: Lékié division, north of Yaoundé (villages of Nkolseb and Nkoumetou)

Extent (no. of respondents): 311 women farmers (83 specifically about fields)

Topics covered: type of field; changes in field types; field associations; farm size; labor requirements; marriage; income, expenditure and differentiation

Other topics covered: history of Beti agriculture in relation to organization of production by marriage and control over women's labor

Other sources of data: archival research in Yaoundé, agricultural and demographic statistics

Bibliography: included

Topics: anthropology, history of Cameroon and Beti

No. of items: approximately 140

Comments: Still seen as the most important work on the women's farming system. Has relevance for farming systems analysis because of integration of data and analysis of households with agricultural decision-making and types of fields. Describes process of change in fields.

2. Title: Traditional Food Crop Growing in the Yaoundé Area (Cameroon) Part I: Synopsis of the System. Part II: Crop Associations, Yield and Fertility Aspects

Author(s): H.J.W. Mutsaers, P. Mboumbou, Mouzong Boyomo

Date: 1981 (study carried out between May 1975 and Sept 1977

Source: Agro-Ecosystems 6 (1981): 273–303. Elsevier

Survey location: Lékié and Mfou divisions

Extent (no. of respondents): a number of villages in Mfou and Okola districts

Topics covered: crop densities, nutrient budget (groundnut field)

Other topics covered: n/a

Other sources of data: terminology in Ewondo and French (from Westphal); yield data

Bibliography: included

Topics: agricultural systems of center/south Cameroon

No. of items: 24

Comments: "Some improvement or stabilization of the system should be possible through better crop residue and fallow management, but in order to raise productivity significantly, external fertility would have to be introduced" (p. 303).

3. Title: Report on exploratory survey and establishment of IRA-ITA-IDRC on farm research work in villages of Yaoundé and Bikok areas. Parts I and II

Authors: Ay, P., A. Foaguegue, L. Nounamo, M. Bernard, R. Mankolo and Chr. Tho

Date: 1986

Source: IRA-IITA-IDRC On-Farm Research Project; Centre de Recherche Agronomique de Nkolbisson; B.P. 2067; Yaoundé, Messa, Cameroun

Survey: Five villages near Yaoundé (Okola) and Bikok: Febe, Nkolkumu, Elig Essombala, Ebakoa, Abangmindi

Extent (no. of respondents): group interviews of men and women, interviews with selected women farmers

Topics covered: soils, fallow management; cropping patterns; crop sequences; list of plants; farms with food crops intercropped with cocoa; plant densities

Other topics covered: socioeconomic factors (history, demography)

Other sources of data: Other areas of information exchange: Bambui station, Nyombe and Ekona; 1984 agricultural census; 1976 census.

Bibliography: included

Topics: most items are listed in this bibliography already

No. of items: 15

Comments: Very specifically addresses issues of fallow management and soil fertility; information on use of chainsaws; notes an alarming trend toward rural outmigration; discusses importance of, and difficulties in, contacting women farmers.

4. Titles: Intra-Household Dynamics and State Policies as Constraints on Food Production: Results of a 1985 Agroeconomic Survey in Cameroon. Prepared for the conference on Gender Issues in Farming Systems Research and Extension, University of Florida, Gainesville, 26 February 26 – 1 March 1986

Food Production, the State and the Household in Southern Cameroon: Results of a 1985 Agro-economic Survey. Boston University African Studies Center, Walter Rodney African Studies Seminar. 10 March 1986.

Author: Jeanne Koopman (Henn)

Date: 1986 (survey 1985)

Source: Russell

Survey location: two villages 50 and 70 miles northwest of Yaoundé (on the edge of the forest). Bilik Bindik is located on a major paved highway. Mgbaba II is extremely isolated from national and even local food markets. [This is no longer true according to Doyle Baker of IITA/NCRE. The recent construction of a road in this area would make for an interesting restudy.]

**Extent (no. of respondents):** 40 rural families; fields measured

**Topics covered:** single interview questionnaire covered labor and returns for a comprehensive range of subsistence and market oriented production activities. Estimates made of production.

**Other topics covered:** cross references to other works

**Other sources of data:** none

**Bibliography:** included

**Topics:** Cameroon farming systems

**No. of items:** 8

**Comments:** Total labor time for women is 63 hours/week, and for men, 27 hours/week. Women spend over 52 hours/week on family food production and domestic labor which brings them absolutely no monetary return (men spend less than 8 hours/week). Women will nevertheless give up leisure time to cultivate food for the market but men will not, despite the fact that the returns to labor for men's crop (plantain) are much higher. Men's input into women's groundnut fields does not change with increased market access. This study is a good example of how a hypothesis can be tested with a survey instrument and more intensive research.

## **E. Village Studies**

1. **Title:** Le système de production vivrière dans la zone d'Edea: Enquête agroécologique de quatre villages

**Author(s):** Gunther Stachel with Cosme Dikoumé

**Date:** 1984 (precise date of survey not given)

**Source:** Institut panafricain pour le développement. Les Cahiers de l'IPD/Collection, organisation et gestion du développement 11, No 2

**Survey location:** four villages in Edea Zone (on Sananga river, south of Douala) Dehane, Nkakanzok, Lom-Edea, Koukoue

**Extent (no. of respondents):** 37 fields

**Topics covered:** field characteristics; types of fields; plant densities and associations (correlation between quality of the soil and plant densities); types of fallows; types of crops

**Other topics covered:** critiques of "green revolution" type technological solutions for Africa and the rationality of African agricultural production techniques

**Other sources of data:** research on "green revolution" and its consequences and on farming systems in other parts of Africa. Interviews with three local department of agriculture

officials. Bibliographic research was done at IITA, ONAREST, ENSA, SODECAO, MINAGRI and PAID in Yaoundé.

Bibliography: included

Topics: farming systems in Cameroon, and critiques of the "green revolution"

No. of items: about 75

Comments: the authors have a twofold goal in this work. They describe the farming system of Edea and use this description to launch a critique of green revolution and western agricultural approaches. The research is very detailed, coming from direct observations and measurements of fields.

2. Title: Zengoaga: Etude d'un village camerounais et de son terroir au contact forêt savane

Author: J. Tissandier

Date: 1969

Source: Paris: Mouton

Survey location: Zengoaga (northeast of Yaoundé) (Division Haut Sananga)

Extent (no. of respondents): carried out in village during an eight month period in 1964; measurement of all fields in village; yields; four families studied over a one year period as to labor time and meals (one week per month); interviews concerning history and geneology of the village.

Topics covered: different types of fields including map of how fallows are spatially arranged (p.47); production-consumption figures (insufficient production); reasons for poor yields; labor time of each activity.

Other topics covered: geological aspects, ethnic histories, maps and atlas

Other sources of data: see D. Martin 1964. Etudes pedologiques dans le centre Cameroun (de Nanga Eboko et Bertoua) IRCAM. ORSTOM surveys

Bibliography: included

Topics: general

No. of items: 17

Comments: Discusses the degradation of village life as a result of living along the main road from Yaoundé to the north. Very interesting research on the history of the village, showing how land use changed over time and is related to different clans.

3. Title: Mom: Terroir bassa (Cameroun)

Author: J. Champaud

Date: 1973

Source: ORSTOM

Survey location: village of Mom

Extent (number of respondents): 109 families

Topics covered: food fields, cocoa fields, system of production, land tenure, profitability, development

Other sources of data: soils, climate

Bibliography: included

Topics: reports, ethnography, cf. Marticou (in this bibliography)

No. of items: 12

Comments: includes maps of all fields in the village and division of territory

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## **Resource and Crop Management Research Monographs**

1. Economics of Root and Tuber Crops in Africa, Paul Dorosh, January 1988.
2. Cropping Systems and Agroeconomic Performance of Improved Cassava in a Humid Forest Ecosystem, Felix I. Nweke, Humphrey C. Ezumah and Dunstan S. C. Spencer, June 1988.
3. Indices for Measuring the Sustainability and Economic Viability of Farming Systems, Simeon K. Ehui and Dunstan S.C. Spencer, November 1990.
4. Opportunities for Second Cropping in Southwestern Nigeria. H.J.W. Mutsaers, February 1991.
5. A Strategy for Inland Valley Agroecosystems Research in West and Central Africa, A-M. N. Izac, M.J. Swift and W. Andriesse, March 1991.
6. Production Costs in the Yam-based Cropping Systems of Southeastern Nigeria, Felix I. Nweke, B.O. Ugwu, C.L.A. Asadu and P. Ay, June 1991.
7. Annual Report 1990: Highlights of Research Findings, June 1991.
8. Rice-based Production in Inland Valleys of West Africa: Research Review and Recommendations, R. J. Carsky, October 1991.
9. Effect of Toposequence Position on Performance of Rice Varieties in Inland Valleys of West Africa, R. J. Carsky and T. M. Masajo, October 1991.
10. Socioeconomic Characterization of Environments and Technologies in Humid and Sub-humid Regions of West and Central Africa, Joyotee Smith, February 1992.
11. Elasticities of Demand for Major Food Items in a Root and Tuber-Based Food System: Emphasis on Yam and Cassava in Southeastern Nigeria, Felix I. Nweke, E. C. Okorji, J. E. Njoku and D. J. King, February 1992.
12. Annual Report 1991: Highlights of Research Findings, August 1992.
13. Ten Years of Farming Systems Research in the North West Highlands of Cameroon, D. McHugh and J. Kikafunda-Twine, September 1992.

The International Institute of Tropical Agriculture (IITA) is an autonomous non-profit institution, with headquarters on a 1,000-hectare experimental farm at Ibadan, Nigeria. It was established in 1967 as the first major African link in an integrated network of international agricultural research and training centers located in the major developing regions of the world.

Funding for IITA came initially from the Ford and Rockefeller foundations. Land for the experimental farm was allocated by the Government of the Federal Republic of Nigeria. Principal financing has been arranged since 1971 through the Consultative Group on International Agricultural Research (CGIAR).

**The Resource and Crop Management Division (RCMD)** is concerned with two of the three main thrusts of IITA research, namely: resource management research, which is the study of the natural resource base with a view to refining existing resource management technologies and devising new ones, and crop management research which aims at the synthesis of the products of resource management research and plant breeding into sustainable and productive cropping systems.

The goal of RCMD is to develop economically and ecologically viable farming systems for increased and sustainable production by the smallholder or family farmer of Africa, while conserving the natural resource base.