



DESFIL
Development Strategies for Fragile Lands

PN-ABR-177

PA 81224

DRAFT

DESFIL Natural Resource Policy Taxonomy and Analysis

Sponsored by:
Agency for International Development
R&D/EID/RAD

Submitted by:
Development Strategies for Fragile Lands (936-5438)
AID Contract Number: DHR-5438-Q-00-1091-00

Prime Contractor:
Chemonics International

Subcontractor:
Abt Associates

February 1993

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FORWARD

This study is an initial effort to conduct a natural resources policy inventory through a review of literature limited to five Francophone countries in Sub-Saharan Africa (SSA). It is intended to be the first step in developing the natural resource policy component of DESFIL's taxonomy and analysis framework for SSA. It will continue to be refined through further desktop studies and field-level case studies in SSA.

The taxonomy will include (a) an inventory of traditional and improved agriculture and NRM practices for several agro-ecological zones, (b) a manual describing how to conduct an inventory using participatory rural appraisal (PRA) techniques, and (c) a workbook describing how to use the inventory to develop strategies for fragile lands management. The inventories are to describe biophysical, socioeconomic, policy, and cultural conditions which determine the benefits and costs of the practices and whether they are likely to be adopted over wide areas. Conditions conducive to community-based natural resource management are a key topic of the DESFIL inventory. The inventory will assist the policy maker, analyst, and practitioner by providing information and analyses about natural resources and the trade-offs inherent in development policies at the macro and sectoral levels. The DESFIL taxonomy is an analytical tool designed to help the Africa Bureau and USAID field missions engage in fruitful dialogue with host-country authorities, local communities, and NGOs/PVOs for the purpose of designing, implementing, and monitoring NRM programs and projects.

This initial review of the literature identifies issues that relate directly to interactions between policy and natural resources management (NRM). Each of the issues needs detailed inquiry to better understand how NRM can be improved. DESFIL can help bridge this information gap by developing the policy component of its taxonomy. Some of these information gaps and needs are specific to a particular country, but other issues are broader.

- One broad issue is how to go from localized success to larger-scale use of NRM practices. Which conditions affected by policy are specific to local situations and which have broader applicability?
- A related issue is to determine which policies would encourage the transfer of NRM practices successfully demonstrated on the village's common fields to widespread adoption by farmers on their individual, private fields? There is need to clearly understand the role of property ownership (common, open access, private, state-owned) and risk avoidance strategies that determine which techniques are applied by users.
- Another important issue is how to come to grips with the role of the private sector, not only farmers' cooperatives, but also individual farmers --women and men, processors, transporters, and input distributors. How to reconcile the new "social contract in NRM," which is being forged among the state, local institutions and NGO/PVOs in SSA, and the increased market

liberalization and private sector development, which are the core elements of the structural adjustment policies pursued by these countries?

Country-specific information needs and gaps and how DESFIL can contribute to bridge them are briefly examined below. The present analysis is preliminary in nature, mostly because information that already exists was not available to the author at the time this document was written.

Cameroon

DESFIL ecozone: Tropical humid lowlands. Cameroon is one of the few USAID NRM Group I and II countries with a significant humid forest ecosystem. Moreover, Cameroon contains the major ecozones of SSA, so that within its borders, one could study the fit or lack of it, between national policy measures and NRM in different ecozones.

Research themes: Natural forest management and sustainable agriculture. Tropical rainforest degradation results from intense logging, encroachment of smallholder farmers, plantation agriculture, and road construction. This degradation has negative impact on animal and plant diversity. Past agricultural policies adversely affected the profitability of tree crops, such as coffee and cocoa, and led farmers to switch to foodcrop production.

Research issues: Economic policies, property rights, technology. USAID/Cameroon's strategy stresses policy and property rights changes (concessions) in forest management and controlled use of fragile lands and buffer zones. There is limited information about the impact of the duration of concessions on forest management, the success or failure of natural regeneration of the moist forests, and the impact of farmland encroachment. There is also need to analyze the impact of economic policies on the crop mix and subsequent land management practices used by farmers. USAID/Cameroon was deeply involved in the liberalization of the fertilizer subsector and the drafting of the cooperative code for cashcrop farmers after the collapse of the coffee and cocoa marketing board. To what extent have reduced fertilizer subsidies and increased role of private distribution changed farmer's use of fertilizer and other practices and how have these changes improved natural resource management?

Guinea

DESFIL ecozone: Steep slopes. Guinea was selected because of its mountainous environment and the importance of the watershed in the Fouta Djallon Highlands. However, the country presents a diverse range of ecosystems, although not as diverse as Cameroon.

Research themes: Sustainable agriculture and forest management. In the high valleys of the Fouta Djallon Highlands, slash and burn cultivation and overpopulation have created erosion and soil fertility problems in many producing areas. These problems have implications for watershed management. Forests in Guinea are not as degraded as elsewhere in West Africa, but the capacity of Guineans to manage these forests may be less developed compared with neighboring countries because of limited human and capital resources.

Because of the previous authoritarian regime, there has been a lack of institutionalization for local, effective participation of resource users in development projects.

Research issues: Technology, property rights, policy, gender issues. USAID projects in the Fouta Djallon Highlands seek to increase local population access and control over land and water resources through agroforestry and conservation practices. Gender issues are important in these areas where women are responsible for agriculture production around compounds and lowland gardens. Over three decades of disastrous economic policies and pervasive human rights abuse, Guinea was depleted of skilled manpower and important financial resources, reverting the country to extensive and damaging NRM practices. Guinea has now engaged in more liberalized policies and a democratic process. Which policies have been designed and implemented? What has been the impact of those policies? What have been resource users' responses to the recent political and economic changes?

Madagascar

DESFIL ecozone: Steep slopes. Madagascar's unique biodiversity is threatened by degradation. The country also faces severe soil degradation in the mountainous environment.

Research themes: Sustainable agriculture. Madagascar has gone from a long tradition of a self-sufficient producer to an importer of rice in recent years. Inefficient cultural practices coupled with high population growth have resulted in the cultivation of fragile lands, leading to massive degradation of the island's highland slopes.

Research issues: Technology, policy. Because of Madagascar's uniqueness, most NRM studies and programs had emphasized biodiversity, and neglected the relationships between NRM and sustainable agricultural development. The poor performance of the rice subsector is explained by inappropriate technology and government policies. USAID programs emphasize better techniques and incentives to increase yields and to reduce pressure on fragile soils and watersheds. Madagascar is undergoing profound political and institutional changes that have strong implications for local management of natural resources. The rapid growth of NGOs holds promises for increased participation of the local population in natural resource management. The development and use of DESFIL's taxonomy will assist policy makers and development planners to better understand the interactions between government policies and NRM practices on steep slopes.

Mali

DESFIL ecozone: Semi-arid zone. Mali is selected to represent Sahelian conditions of SSA.

Research themes: Forest management, sustainable agriculture, indigenous peoples. Forest management for fuelwood production and sustainable agriculture are major problems in Mali. As in other Sahelian countries, management of natural forests is now favored over large scale public forest plantations. USAID has funded several activities to generate and extend better farm practices in the fragile lands in Mali. These activities have

helped create successful village associations (VAs), which may play a significant role in natural forest management and sustainable agricultural development.

Research issues: Technology and property rights, gender issues. USAID seeks to develop techniques to improve agroforestry, prevent soil erosion, and reverse the degradation of natural resources. The mission also seeks a policy dialogue in Mali about the rights and responsibilities of the government, local communities and individuals about land, tree and resource tenure. There are important gender issues in natural forest management, as women are traditionally assigned to the collection of fuelwood and many other forest products. There is a wealth of information and experience about NRM in Mali. There remains, however, a sense of scattered information and the gap between localized success and widespread adoption of NRM. Has the increased access to credit by the successful village associations been translated into sustainable agricultural practices? How have the VAs used their effectiveness to resolve land and tree tenure issues, among themselves and with the state? Can these VAs be duplicated outside the cotton cash cropping system of the better endowed southern Mali? In Northern Mali, the "Bouna Agreement" is an attempt to revive a long-lost cooperation among the various users of natural resources (farmers and pastoralists) in the Sahel. What lessons can we learn from the establishment and implementation of this agreement and can similar agreements be devised in Mali and elsewhere in the Sahel?

Niger

DESFIL ecozone: Semi-arid zone. Niger is a second Sahelian country selected for SSA .

Research themes: Forest management, sustainable agriculture, indigenous peoples. Many observers believe that the management of natural forests by indigenous populations may be more economical than large scale fuelwood plantations that many Sahelian countries undertook in the 1970s. The fragile natural resource base in Niger needs to be protected against the encroachment of extensive dryland cereal cultivation.

Research issues: Property rights, technology, gender issues. The USAID-funded Forest and Land Use Planning (FLUP) project has created the basis for a rural code, which attempts to provide local people with incentives to rationally manage natural forests. Innovative agronomic practices are also needed to increase and sustain the productivity of (inter)cropping systems. There are important gender issues in natural forest management, as women are traditionally assigned to the collection of fuelwood and many other forest products. One former manager of the FLUP project warns that despite the exemplary framework of this project, its success is still fragile, because of limited knowledge in bushland forest dynamics and lapses in implementing the management plan. Furthermore, as in Mali, Niger's successes in natural forest management and cooperative organization are localized. The ingredients and lessons of sustainable use of natural resources are scattered. What would it take to create strong, effective, and democratic cooperatives or alternative users' associations elsewhere? What is the impact on NRM of mobilizing rural savings for economic development?

Despite their distinct characteristics, these Francophone countries have similar institutions and legislation, because of their common colonial history. While many policies developed to cope with natural resources degradation would be country-specific, many lessons from DESFIL's study of these policies would have strong applicability across other SSA countries.

SECTION I INTRODUCTION

Sub-Saharan Africa (SSA) is losing ground to other developing countries in food security and overall economic development. To meet this crisis, Africa must turn to agricultural-led development. Strategies to improve food security and agricultural development, however, must ensure the continued availability of resources to permit greater productivity and the conservation of biodiversity in the future. Good management of natural resources is critical for sustainable development and the preservation of benefits derived from the environment. Yet, Africa's natural resources have become seriously degraded since the 1970s, as its food situation has deteriorated. Obvious causes of the degradation of natural resources are population growth and macroecological conditions such as repeated, prolonged droughts. Other key factors, often less emphasized, however, are African adverse policies and management of natural resources. Of particular interest is the role and impact of policies on the effective participation of local peoples in the management of fragile lands in Sub-Saharan Africa. "For, unlike other areas of the world, environmental degradation has not resulted from the limitless greed of wealthy developers, but [mostly] from the need of poor, hungry peasants and herders to expand production into ever less productive lands" (USAID).

Drawing on two decades of experience over African countries, AID has concluded that "purposeful change" is needed to: (1) tap the potential of participatory, on-farm tree planting and natural woodland management options; (2) build African capability to plan and execute natural resources programs and projects; and (3) reformulate policies to permit greater integration of forestry and agricultural concerns and strengthen security of resource tenure.

In recent years, policy reforms have been applied to agricultural production and exports and the overall economy in many SSA countries. Still far less attention has been paid to policies applied to natural resource management, especially fragile lands. How one can best analyze the role and impact of current policies on the behavior of fragile lands users? How to design programs that address key issues, and monitor the implementation of measures? There is a need for a tool to diagnose the impact of policies, guide the design of policy reforms, and monitor the implementation of policy measures that affect the management of fragile lands in Africa.

One such analytical tool, the policy inventory, has been developed for and successfully applied to natural resource management in Latin America and the Caribbean. In *The Green Book: An Environmental Policy Source Book*, developed by the Agricultural Policy Analysis Project, Phase II (APAP II) with support from the Development Strategies for Fragile Lands (DESFIL), Johnston, et al, (1992) have compiled key lessons learned from the Latin American and Caribbean experience. The objective of the present document is to conduct an initial analysis that applies, adjusting as needed, the Green Book to the specific

issues of natural resource management of Sub-Saharan African, particularly Francophone Africa. The selected countries are Cameroon, Guinea, Madagascar, Mali, and Niger.

The terms of reference of this study are to (1) identify the role of policy and policy implementation as they constrain or enhance effective local participation in fragile land management related to [selected] African countries and [priority] issues; (2) use the draft policy taxonomy, providing examples, synthesizing the priority policy issues in selected African countries.

The document discusses the conceptual framework that underlies the policy inventory, DESFIL research agenda, lessons learned from LAC, a suggested DESFIL taxonomy for Sub-Saharan Africa, and examples from five selected Francophone countries.

DESFIL natural resource policy taxonomy fills a unique niche in ARTS/FARA's analytical agenda. It meets policy-makers, analysts and practitioners' demand for information and analysis about the consequences for natural resources of the trade-offs inherent in development policies at the macro and sectoral levels. Through a systematic framework, it makes information on these consequences more accessible to those involved in policy debates. This taxonomy will be developed alongside DESFIL soil conservation and fertility enhancement (SCaFE) taxonomy. These taxonomies are envisioned as hands-on tools to enhance the ability of all stakeholders to understand how policies, institutions, and technologies can be changed to enhance sustained local participation in better natural resource management.

SECTION II

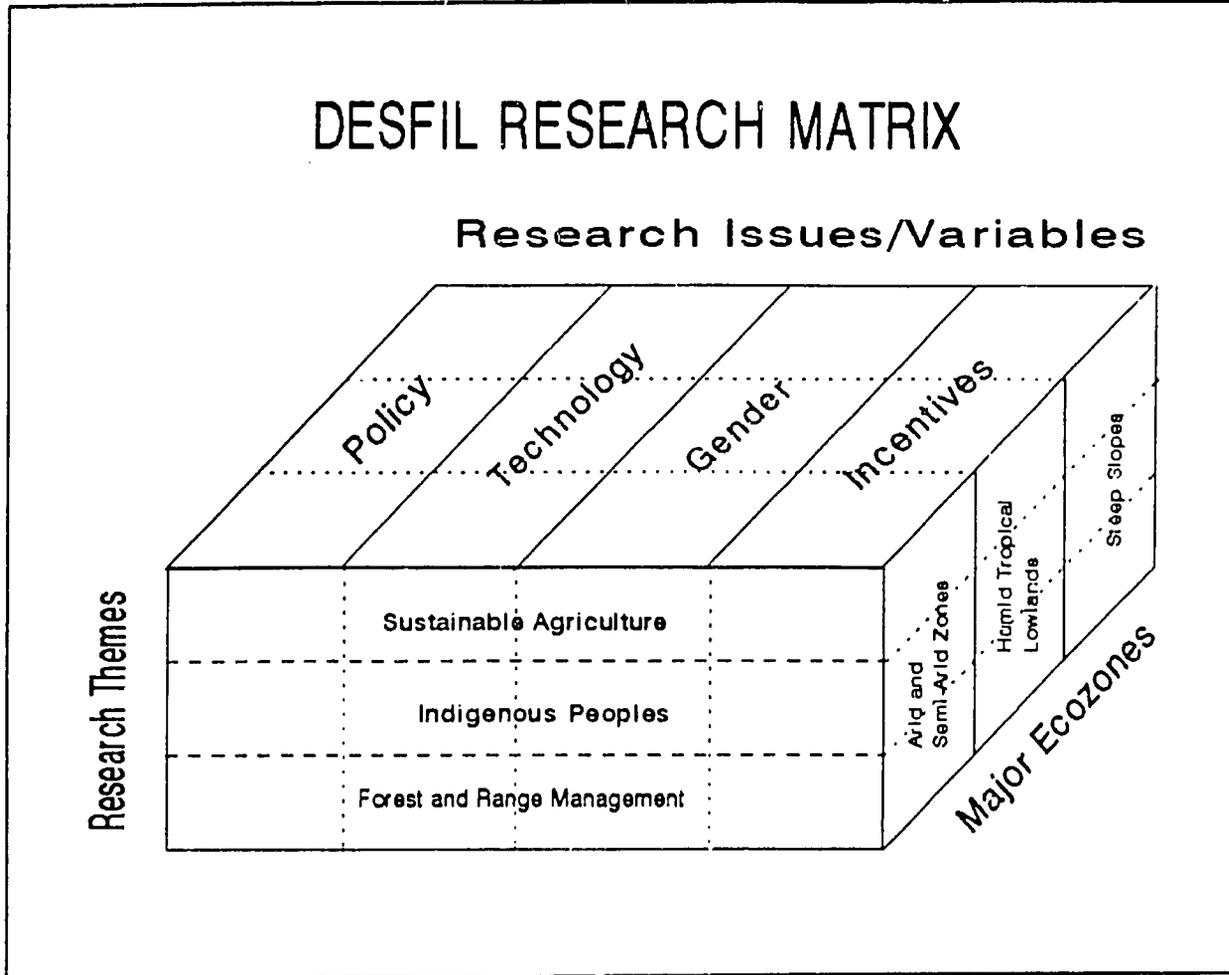
DEFIL RESEARCH AGENDA

The goal of Development Strategies for Fragile Lands (DEFIL) is to help countries and regions develop strategies to improve fragile land management, through the enhancement of sustained local participation in natural resource management (NRM). The DEFIL strategy is to understand the interactions between resource users (individuals, groups, firms, governments) and fragile lands and then to fully incorporate resource users into efforts to improve fragile lands management.

The underlying conceptual framework of DEFIL's strategy is that the behavior of natural resources users, which impacts on natural resource conservation, is itself affected by the institutional and socioeconomic environment. The country's institutional and socioeconomic environment is also affected by the world macroeconomic environment. The impact of users' behavior depends on the biophysical characteristics of the agroecological system being used. The impact of users' behavior can be measured in terms of conservation (biophysical changes), and contributions (positive or negative) to economic growth and welfare. Key to this framework is to establish the links between users' NRM practices and their key determinants, which are the biophysical environment, the macroeconomic and institutional situation, the local community's norms and beliefs, and users' technological knowledge base.

Exhibit II-1, on the next page, presents a schemata of DEFIL research matrix, showing the interrelationships among the three basic elements of DEFIL research agenda: ecozones, research themes, and research issues. Fragile lands inhabit three major ecozones: steep slopes, arid and semi-arid zones, and humid tropical lowlands. This diversity of ecozones is reflected across the countries selected. DEFIL focuses attention on three priority research themes: natural forest management, sustainable agriculture, and the role of indigenous peoples in the management of these systems. Natural resource management programs and projects in the countries selected address these areas of interest. Key issues or variables affecting the behavior of natural resource users of fragile lands include: economic policies, property rights and institutions, technology development and use, and gender issues. The research matrix suggests possible combinations or cells of research topics that incorporate aspects of the three basic elements of DEFIL research agenda.

Exhibit II-1



SECTION III
MAJOR NATURAL RESOURCE MANAGEMENT ISSUES/THEMES
IN SSA AND THE POLICY INVENTORY

This section overviews the major issues of natural resource management confronting SSA and the relevance of the policy component of the DESFIL inventory to the study of these issues. Its objective is to set the stage to examining how the inventory applies, and needs to be adjusted to the specific issues of natural resource management of Sub-Saharan African, particularly Francophone Africa.

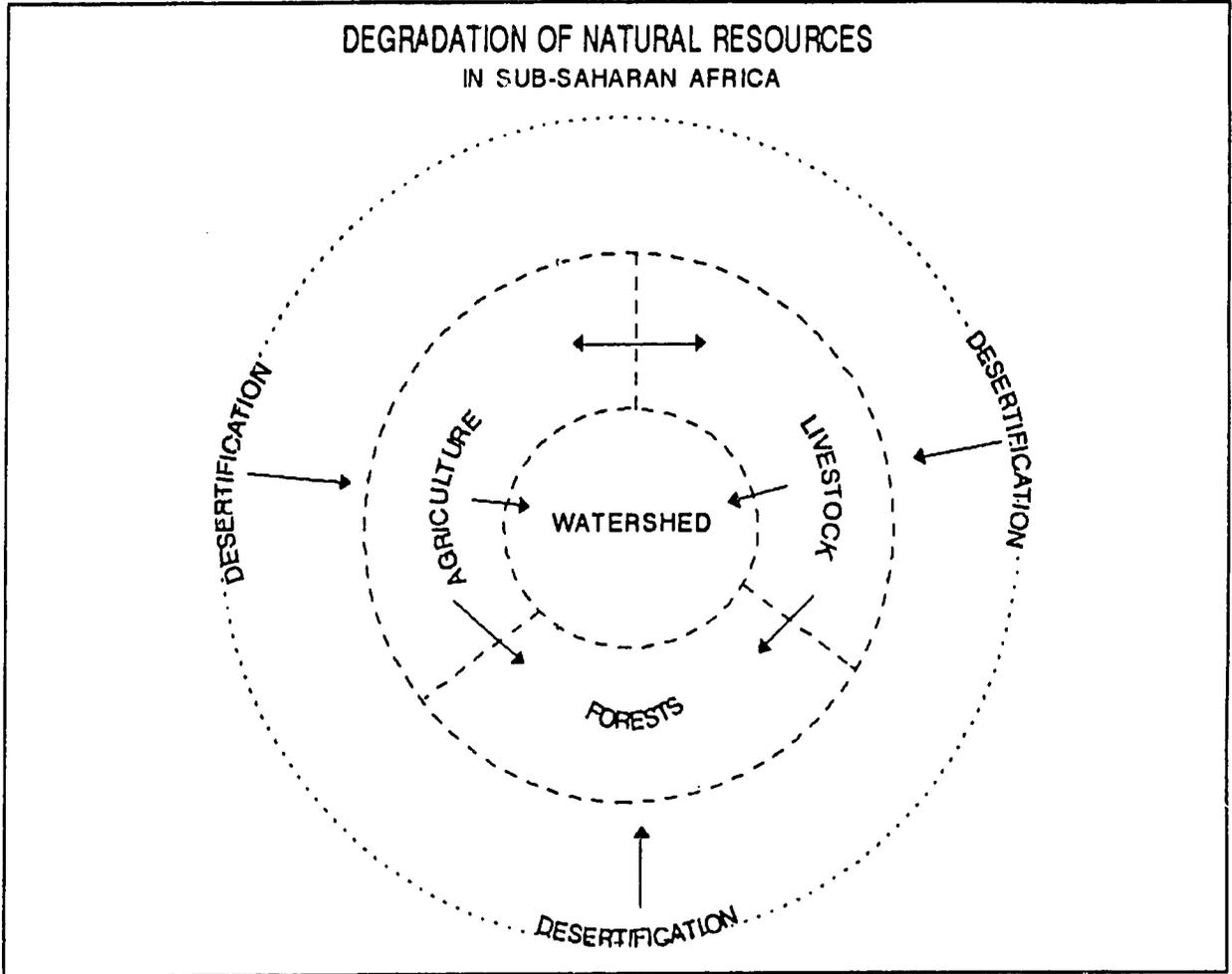
A. Major Natural Resource Management Issues in SSA

SSA covers diverse ecologies ranging from desert areas to semi-arid zones, moist evergreen tropical forests, and cool, temperate highlands. The picture of a land-surplus continent is rapidly fading in face of the degradation of the natural resource base induced by growing populations and global climate changes. Exhibit III-1, on the following page, pictures this degradation. Pressure from both livestock and agriculture practices encroach on forests, natural parks, and reserves, whose sizes may be shrinking in many countries. Agriculture and livestock also compete against each other for land and water resources. In the semi-arid areas, desertification looms large over agriculture, livestock production and the forest base.

The overriding concern in SSA is the improvement of agricultural production through sustainable practices, which preserve and enhance the natural resource base for future use. The major NRM issues in SSA include:

- Sustainable (rainfed/irrigated) cropping systems
- Forest management
- Livestock/range management
- Desertification
- Parks/games/reserves
- Watershed management

Exhibit III-1



B. The Green Book

Fragile issues vary by region and country and the effect of different policies on resource user behavior also varies significantly across NRM practices. The policy taxonomy developed by APAP and DESFIL (Johnston, et al, 1992. The Green Book) has been successfully applied to the analysis of policy impact on natural resources in Latin America and the Caribbean.

The Green Book grew out of the distillation of lessons learned from policy inventories conducted in LAC, as well as the review of literature on NRM policies in Asia and Africa. As adapted from Bremer (1987), the natural resource policy inventory is an analytical tool developed to improve decisionmakers' understanding of the overall impact of current policies, by highlighting interactions and serving as a guide to further policy dialogue and analysis. It provides answers to these basic questions: (1) What are the main impacts of current policies that should be considered in evaluation? (2) Do these policies promote or hinder the conservation of natural resources? (3) Which policies at the macroeconomic and agricultural sectoral levels should have priority for reform, given their impact on the conservation of natural resources and agricultural development? By design, the policy inventory is a flexible, low-cost technique that analysts can use to carry out assessments of the natural resource policy situation to support policy dialogue, or assist government and AID mission in the policy reform process in a particular country. DESFIL natural resource policy taxonomy is an information base to be used in a framework for diagnosing, designing, and monitoring policies that affect the management of fragile lands, shown in Exhibit III-2, on the next page.

The policy inventory and strategy design framework is consistent with the Africa Bureau ARTS/FARA/NRM organizing framework and the major themes of the ARTS/FARA/NRM analytical agenda: (1) The establishment of policy, institutional, and socioeconomic conditions that contribute to widespread adoption of appropriate NRM practices; (2) The identification of the range of NRM practices for each agro-ecological zone and each type of resource user; and (3) The sustainable economic and environmental impacts from adoption of various NRM practices. As an analytical tool, the Policy Inventory addresses the cross-cutting theme of NRM analytical agenda regarding the identification and development of analytical tools and methods to monitor progress, capture lessons learned, and conduct analyses. The identification of policies and institutions in policy design and implementation address level II of the ARTS/FARA strategic framework: the policy, institutional, and socio-economic conditions that determine resource users' behavior. By reviewing the current performance and analyzing the impact of policies on natural resources, the policy inventory identifies key current NRM practices (level III), changes in biophysical conditions of the agroecosystems and environment (level IV), and economic impacts on resource users and the country (level V).

Exhibit III-2

POLICY INVENTORY AND ANALYSIS FRAMEWORK FOR NATURAL RESOURCES MANAGEMENT SYSTEMS

- **OVERVIEW CURRENT PERFORMANCE OF NRM SYSTEMS**
- **IDENTIFY POLICIES AFFECTING NATURAL RESOURCES**
- **IDENTIFY INSTITUTIONS DESIGNING AND IMPLEMENTING POLICIES**
- **ASSESS THE IMPACT OF POLICIES ON NATURAL RESOURCES**
- **ANALYZE POLICY ALTERNATIVES FOR NATURAL RESOURCES MANAGEMENT**
- **DESIGN POLICY PROGRAMS FOR NATURAL RESOURCES MANAGEMENT**
- **MONITOR AND EVALUATE POLICIES AFFECTING NATURAL RESOURCES**

The Green Book will be a valuable reference book in future natural policy inventories. It has compiled key lessons learned about all major policies that impact on users of natural resources. To expand the knowledge base for and application of the Green Book taxonomy in Africa, region and country specific analyses that identify policies affecting DESFIL priority areas are needed. Such analyses serve as support for the AID/Africa Bureau research agenda as well as identifying likely collaborating missions in Africa.

SECTION IV DESFIL POLICY TAXONOMY FOR SSA

Three broad categories of policies impact NRM: policies specific to NRM, agriculture/livestock sector policies, and macroeconomic and institutional policies. DESFIL policy taxonomy for SSA addresses those policies that apply more specifically to the African context and that are central to DESFIL research. The taxonomy focuses on DESFIL's major research themes, which are sustainable agriculture and forest management by local, indigenous people. What is the range of current and alternative policies that can be brought to bear on first-line, natural resources users' decisions to engage in sustainable practices regarding agricultural production and forest management?

The development of the DESFIL policy taxonomy for SSA follows a three-step process. In the first step, for each cluster of important policies, the DESFIL taxonomy provides an overview of the issues related to the African context. Major differences between SSA and LAC are examined in this overview. In the second step, the DESFIL taxonomy sorts out and adapts, if necessary, the Green Book's key points that apply to SSA, based on a broad literature review and the author's experience of the issues. Unless most key points are taken from sources other than the Green Book, the DESFIL taxonomy does not reference the Green Book. In most cases, the key points are taken verbatim from the Green Book. In other cases where, for the same policy, additional insight is added to the Green Book, both the Green Book and the source are given credit. In the third step of this exercise, the taxonomy illustrates these key points with examples from the five selected countries. This desk-top analysis must be viewed as preliminary, because the illustrations are evolving as new evidence is generated, and because until late in the process, the documents reviewed were gathered from the limited library of the DESFIL project.

Natural Resources Management Specific Policies

By design, NRM specific policies attempt to impact directly on the sustainable use and conservation of natural resources. The policy inventories in LAC and studies in SSA show that these policies are designed and implemented by several overlapping, often competing agencies. In keeping with DESFIL agenda, this section centers on policies for (1) forest management and (2) soil conservation and fertility enhancement, a key component of sustainable agriculture in SSA.

A. Forest Management

Forest management takes different dimensions depending on the ecozones. For example, the biophysical characteristics of the moist, rainforests in southern Cote d'Ivoire and equatorial, central Africa are different from that of the transitional, semi-deciduous forests in central Cote d'Ivoire and the much dryer woodlands of the Sudanian and Sahelian zones. Different types of forests demand different management practices, thus often different

incentive structures. Yet forests from these diverse ecozones may face common problems, such as farmland encroachment and fuelwood production for growing populations, and thus share common sets of policies, for example measures to promote better, effective natural resources management by local populations. Also, policies that tend to be associated with tropical moist forests, for example concessions, may be visited for application to dryland forests.

The Green Book policy taxonomy regarding forest management applies to SSA, but with several nuances. The impact on forests of inefficient concessions and timber forest revenue generation policies are similar in LAC, Asia and Africa (see Grut, et al, 1991). A distinctive feature of SSA is the absence of private forest ownership, thus preventing the use of fiscal incentives for reforestation, except possibly in Liberia where forest land is almost entirely in the hands of large concessions. Forest codes stir a considerable debate in Francophone Africa, apparently more so than in Anglophone countries, because of the different colonial legacies in the two groups of countries. Another valuable addition to the Green Book would be policies promoting agroforestry, which is becoming prominent in SSA, although agroforestry may be viewed as a cropping technique rather than a forest management practice.

A1. Concessions for Use of Public Timber Forests

The discussion of concessions here applies to the management of tropical moist hardwood forests (TMF) of West¹ and Central Africa. In addition to the Green Book, this section, as others on timber forest revenue and forest trade and pricing policies, relies heavily on Mikael Grut, et al, *Forest Pricing and Concession Policies: Managing the High Forests of West and Central Africa*. Washington, D.C.: World Bank Technical Paper No. 143, The World Bank. Missing in the literature reviewed is information about the role of local resource users in, and examples, if any, of sustainable use of natural moist forests in SSA.

Key points

- When timber concessions on public lands are too short and/or insecure there is no incentive to manage natural forests. This results in resource mining.
- However, the length of the concession is not likely to be a determining factor in the management of the forest if concession fees are extremely low compared to revenue (i.e., when there are excess profits or large economic rents).
- The concession award process in Africa is complicated, lengthy and arbitrary. It generates inefficiencies and encourages corruption (Grut, et al, 1991).

¹ In Burkina Faso, until the early 1970s, two private companies had concessions to exploit remnants of gallery forests in this Sahelian country.

- Competitive bidding helps to reflect the value of concessions, increases revenues and discourage wasteful acquisition of large and speculative concession areas (Grut, et al, 1991).
- Logging concessions should be replaced by forest management concessions in West and Central Africa (Grut, et al, 1991).
- However, management plans with specific controls on forestry practice will be ineffective if they cannot be policed (The Green Book). Most forestry departments lack personnel and material support to control logging operations, even minimal forest management.

Illustrations

Cameroon

Duration of concessions. Concessionaires have three years, renewable, to exploit logging units, or *assiette de coupe*. But once the unit is closed, the concessionaire cannot come back to it, even if some standing timber has gained acceptable commercial value. These short terms do not provide an incentive to engage in efficient, ecologically sustainable logging.

Award process. Concession attribution procedure may take up to five years, and require a presidential decree. Concessions of up to 200,000 ha are subdivided into 2,500 ha logging units. This lengthy process encourages influence peddling and acquisition of large concession areas.

Conditions and restrictions. These conditions and restrictions include a management plan and other conditions, in a *cahier de charges*, and the restriction of exploiting logging units. Permissible annual harvest may mandate a certain timber off-take, but trees are not marked and control of how much is harvested is ineffective.

A2. Timber Forest Revenue Generation

Key points

- Forest fees in most West and Central African countries are low because of low fees and low rates of collection, which put a low price on the forest and encourage waste (Grut, et al, 1991).
- Most governments do not or cannot collect even the present low forest fees (Grut, et al, 1991).
- Unless flat charges are differentiated by species and locations, they encourage highgrading, that is, selective exploitation of most valuable timber.

- Charges based on the volume of timber removed, and not the volume of marketable timber, result in highgrading.
- Both flat and ad valorem taxes (based on value) could be differentiated by species, but differentiated rates are difficult to administer because of the large variety of species in tropical stands.
- Sale of timber on the stump has the advantage of less waste since the concessionaire purchases the entire tree. However, it is more difficult to administer and requires professionals to do forest inventories and mark trees and carry out bidding process.
- Relative lower taxes on secondary species could provide incentives for utilization.
- Annual concession rents will be efficiently managed than the multiple forest fees applied by West and Central African states (Grut, et al, 1991).

Illustrations

Cameroon

Cameroon multiple forest fees include several concession taxes and charges on timber volume and area.

Charges on concessions. Initial taxes for the attribution of the concession include a license fee of CFA15/ha and an exploitation tax of CFA2/ha (Grut, et al, 1991). The concessionaire also pays a 5 percent (of *valeur mercuriale*) ad valorem logging tax.

Charges on timber/area harvested. Area based taxes include the one-time fees paid at the time of attribution (safety deposit of CFA40/ha, license fee and exploitation tax), and yearly taxes. Yearly area taxes include communal taxes, reforestation tax, social contribution tax, forestry development tax (which includes regeneration tax, timber promotion and forestry inventory) that total CFA98/ha/year. In addition, concessionaires are charged corporate income taxes.

A3. Forest Product Trade and Pricing Policies

In broad terms, the Green Book policy taxonomy applies to SSA countries, which are attempting to generate revenues while protecting forests. Timber trade policies, resource protection policies, direct government involvements and price controls have been implemented in SSA. For example, many African countries derive important revenues from log export taxes because these taxes are easier to implement than stumpage fees. Faced with increasing local demand, West and Central Africa states have supplemented log export taxes, by domestic processing requirements, export quotas, and log export bans on selected species. One important additional issue to the Green Book policy taxonomy concerns fuelwood pricing policies in SSA in general, and in the Sahel in particular.

Arguments about the impacts of fuelwood collection and technical substitution between fuelwood and other fuel sources (charcoal, liquid petroleum gas) on deforestation center on urban fuelwood consumption. It is often assumed that rural demands are more sustainable than urban demands. Urban demands are concentrated, and therefore more susceptible to policies enforcing their modification. The usual presumption is that the presence of substitutes decreases fuelwood consumption and increases forest stocks. (The discussion of fuelwood relies heavily on William Hyde and David H. Newman with a contribution by Roger A. Sedjo (1991), *Forest Economics and Policy Analysis: An Overview*, Washington, D.C: World Bank Discussion Paper No. 134).

Key points

- Log export bans and domestic processing requirements encourage inefficient domestic processing industries as do other elements of high domestic protection.
- Log export bans can distort domestic production. High value logs are exported and lower quality, low grades are the ones being processed domestically.
- Relaxing export bans and quotas will increase the value of logs and increase incentives for better forest management, as long as other policies, such as management concessions, are implemented to inhibit resource mining.
- Value-based export taxes provide a less distorting domestic processing incentive.
- Government parastatals (*regies*) involved in timber or fuelwood production, marketing and processing have been generally inefficient.
- Price controls on domestic timber have resulted in inappropriate uses of high value species.
- Subsidized gas and improved stoves are presumed to reduce fuelwood consumption and increase forest stocks. However, the impact of these fuelwood substitutes on forest stocks is still ambiguous. Sometimes, (Dakar, Senegal), populations have increased the use of both charcoal and subsidized gas.
- Tax on the transportation of fuelwood into urban areas is an effective policy of limiting the cutting of fuelwood because it is much easier to assess than a tax on cutting, and it differentiates between trade and individual gathering of use for domestic use (Stryker, 1989).

Illustrations

Cameroon

Resource protection policies (bans/quotas). Cameroon's forestry code allocates 60% of the log volume to domestic processing. Grut, et al, (1991) reports than an export ban is being studied.

Price controls and subsidies. Cameroon levies ad valorem export taxes including custom taxes, tax on export logs, and contributions to parastatal organizations for forestry inventory and regeneration. Export taxes in Cameroon generate 57 percent of forest revenues. As in many other countries, export taxes are easier to implement than other forms of taxation. Export taxes are implemented to generate government revenues, substituting for stumpage fees and to protect domestic processing.

Mali

Fuelwood taxes Some argue (Foley, 1986) that increasing fees of cutting permits or taxes of fuelwood brought to urban cities would increase fuelwood prices and government revenues, but not the cost of producing (cutting) trees, and therefore would not increase the incentives to grow wood for sale in Bamako. The reasoning assumes that the dealer who pays the tax, or the cutting permit, passes all the increased cost to consumers and to producers. Increasing fuelwood prices, through taxes or other policies, at levels to change consumers' behavior may also prove to be politically difficult.²

Regulation regarding fuelwood. Shaikh, et al, (1990) report that a government decree imposing the use of improved wood stoves, taking advantage that the design has been accepted by women, led to mass diffusion. The use of improved wood stoves reduces the consumption of charcoal. There was no indication, however, how the decree was implemented and what was the penalty for non compliance.

Niger

Tax on the transport of fuelwood. In the 1980s, the cost of the permit for cutting wood was CFA 35 per stere, extremely low relative to the urban retail price of about CFA 5,500 per stere (Stryker,³ 1989).

² Foley had challenged then (in 1986) the assumption of a "fuelwood" crisis in Mali, arguing instead that the supply of fuelwood was adequate.

³ Stryker, Dirk, J. 1989. "Technology, Human Pressure, and Ecology in the Arid and Semi-Arid Tropics" in Jeffrey H. Leonard and contributors, *Environment and the Poor: Development Strategies for a Common Agenda*, Washington, D.C.: US-Third World Policy Perspectives, No. 11, Overseas Development Council.

A4. Forest Code

The discussion of forest codes in Sahelian countries relies heavily on the following documents: Shaikh, et al, (1988), *Opportunities for Sustained Development: Successful Natural Resources Management in the Sahel*, Washington, D.C.: AID. Asif Shaikh, et al, *The Segou Roundtable on Local Level Natural Resources Management in the Sahel, Segou, Mali May 22-27, 1989*, AID/AFR/Sahel Office. Thomson, et al, (1989), *Options for Promoting User-Based Governance of Sahelian Renewable Natural Resources*, Associates in Rural Development.

Forest code is a prominent facet of the complicated land tenure issues in SSA. At independence, continuing the measures imposed by the French colonial administration in 1935 (Elbrow and Roehgude, 1990), Francophone African countries decreed that all "vacant" land belongs to the state. In the Sahel, in particular, forest codes give states rights over trees in natural forests and on farms as well. Forestry agencies are granted powers to regulate the use of trees on public and private lands as well. Forest codes are a sticking point of contention, with resource users (farmers, pastoralists, woodcutters and gatherers of medicines) pitted against forestry services. Sahelian forestry services, which view themselves as paramilitary forces, have traditionally emphasized more law enforcement and tax collection than forest management and extension. Their broad powers, combined with their lack of resources and low salaries have contributed to unethical practices. With the help of donors, the Club du Sahel and the World Bank in particular, Sahelian countries within the CILSS, are redesigning codes of forestry, pastoral or rural laws. Elbrow and Roehgude (1990) provide *A Layperson's Guide to the Forest Codes of Mali, Niger, and Senegal* to help understand the relationships between tree and forest tenure rules, farmer and community investments in forestry and agroforestry. Freudenberg, of the Land Tenure Center, reports that tenure factors adversely affect the capacity of local institutions, such as *communeantes rurales*, to manage resources in Senegal. The new Senegalese forest code will extend to farmers private rights to trees on their farms (Steve Lawry and Kent Elbow in 1989 and 1990).

Key points

- Because of their limited rights to trees, individual farmers lack sufficient incentives to invest in tree planting and intensive tree management practices on their farms.
- Communities also lack both the economic incentives and the authority that are needed to develop and implement sustainable management plans for nearby natural forests.
- Changes in forest code must involve reforms that will change the policing role of the forestry officers into one of resource management guidance (Segou Roundtable).
- Greater reliance on local land-use management efforts will require accompanying changes in taxing authority, legal reform and extension policies, because many

communities lack the financial, administrative and technical capacity to develop and implement land management plans.

Illustrations

Mali

The impact of Malian forest code on farmers' willingness to investment in agroforestry practices is the subject of many studies, completed or in progress (McLain and Hesseling). The Malian forest code requires a permit to cut fuelwood, even on trees of one's farmland. Although the permit for farmland trees is free, the code has fostered a police mentality among forestry officers and abuses in the issuing of permits.

The "Bouna Agreement" on common resource use in the Niger Inner Delta was reached after several years of negotiations, using conflict resolution techniques to deal with the many interested parties. The agreement will create common property laws to replace the conflicting and contradictory mix of local village lineage claims, ethnic rules, French colonial laws, and recent national common property access rules. The Bouna goes beyond the usual forest code, as it includes also fishing and grazing rights, and protection of a bird sanctuary.

Changing the forest code has budgetary implications, because the Malian government derives important revenues from forest fines.

Niger

Niger's rural code attempts to deal with issues regarding herder/farmer interactions, farm tree tenure, and community natural resource management. The code is part of the ASDG conditions precedent and will reflect the success of Niger's forest and land use (FLUP) project at the Guesselbodi forest.

Cameroon

Land tenure systems of Cameroon's forest area are not clearly defined. The Ministry of forestry classifies forest land into the *Forets Domaniales* (National Parks & Reserves and Forestry production), Community forests, and *Forets du Domaine National*. The administration of wooded savanna is not clearly defined (Grut, et al, 1991). A new forest code is being examined, with the assistance of the USAID mission.

A5. Reforestation Policies

The discussion of reforestation policies is based on The Green Book (Johnston, et al, 1992) and the following document: Hyde, William F. and David Newman, with a contribution by Roger A. Sedjo. 1991. *Forest Economics and Policy Analysis: An Overview*, World Bank Discussion papers No. 134.

Reforestation can mean restoration of degraded stands, enrichment through planting of primary species, or establishment of plantations. Because of the lack of private forests in Francophone Africa, reforestation efforts have usually been large government projects on public lands, supported by international donors. In Cote d'Ivoire, a parastatal SODEFOR, was created in part to coordinate reforestation efforts. West and Central African states have usually emphasized natural regeneration of moist forests. However, inefficient logging and the opening of forests are usually followed by farmland encroachment. Until recently, Sahelian countries have focused on plantations of exotic, fast-growing trees such as eucalyptus, gmelina, and neem species. Now, more and more reforestation efforts are shifting to village or community forestry and natural forest management, in conjunction with the implementation of new forest codes.

Key points

- Reforestation projects that account for the need of local resource users or communities are more successful than large government projects on public lands (The Green Book) because they provide the necessary incentives for local participation.
- Public forest plantations in most Sahelian countries were achieved at high financial cost, loss of indigenous species, and appropriation of land from local populations.
- In return, many public plantations have offered few benefits to local populations other than temporary employment (Weber and Hoskins, 1983) or food aid.
- The negative environmental impacts (soil fertility and water conservation) often reported from exotic species need not apply to all introductions. For example, the neem tree from India generates multiple products and has now become a success story in SSA. Eucalyptus species also provide poles, the demand of which is strong in some regions.
- Natural management of indigenous species generally produces less wood per ha than fast growing exotic species, but production costs are smaller and natural forests generate more multiple products: poles, fuelwood, fodder, forage, fruits and nuts, latex, medicines.

Illustrations

Guinea

Public reforestation. In the past, donor-financed projects hired labor to plant trees in the hope that local communities would come to appreciate the values of these plantations and participate in such efforts (Gaudreau, 1990).

Village reforestation. Food-for-work incentives for planting and gardening were used to enrich natural forest, using exotic species. According to Gaudreau (1990), "the use

of exotics indicates that the forest is managed [by the state] and must be respected. [However,] the project appears to have dealt with tenure issues so that the forest does belong and is managed by the village."

Mali

Public reforestation policies. The Swiss-funded Farako industrial plantation is one of many public reforestation efforts in Mali funded by donors. After adding 200 ha of eucalyptus and gmelina to another 800 ha, the industrial plantation was stopped because of high costs and poor growth and yield performance. The management of the forest is reported to be well grounded in the workplan, but too research oriented, intensive, costly and complex for implementation by local populations.

Fuelwood from semi-industrial plantations is uneconomical; the World Bank First Forestry Project (2,700 ha) cost \$3,000 per ha, and the second \$1,400 per ha (Foley, 1986).

Community and individual plantations. Many traditional common properties, which which have shown impressive results in terms of natural resource conservation, have been constrained by government policies, including expropriation.

The collective village nurseries in the Sikasso region, also financed by Switzerland, illustrate the one-way communication from forestry agents to local populations, who are given free seedlings for village reforestation efforts. Because of this, the project has achieved little in terms of community plantations.

In 1986, Foley (1986) suggested that encouraging private small-scale tree growing around urban cities would have better chances of success if programs focus on pole rather than fuelwood production, because the financial returns on poles are better. These plantations will also contribute to resolve the fuelwood problem.

Individual farmers do sometimes experiment with forest tree plantings, as reported by Shaikh (1989). By improving the land, such farmers increase their sense of property ownership, whereas according to tradition, they do not have legal title to the land. As with other techniques, these early adopters may be followed by more risk-averse, late adopters if they have access to resources. One key condition is the liberty to cut one's trees. The forestry service, which has encouraged farmers to plant trees, was not quite prepared to extend advice to manage these trees when they mature.

Natural forest management. The natural forest management initiated in 1987 at Farako National Forest used degraded soils (less than one meter deep) and reserved the better soils for industrial plantations. This natural forest management strategy includes restoration of degraded stands and enrichment through planting of preferred indigenous trees. Individual farmers are paid for weeding. Villages, divided into "responsibility" regions are equipped with firefighting equipment and paid for firefighting, and they are rewarded to reduce burning. Although it involves community mobilization, such efforts illustrate a top-down

approach and an incentive structure that is unsustainable by either the state or local populations.

Niger

Community and individual plantation. A Swiss-financed project initiated in 1985 communally constructed water catchments which helped villagers plant private woodlots. Food-for-work and free tree seedlings from the forestry service were the incentives provided to attract participants. Private ownership of trees decentralizes the operation. Benefits derived from better crop yields and forest products are providing incentives to continue communal work.

Shaikh reports that farmers in central Niger, around Tahoua, use short rotational forestry techniques to grow trees on small plots of prime agricultural land. In one village (Tama), as in Mali, private woodlots were initiated by one farmer (in 1979), who planted neem trees because eucalyptus seedlings were scarce. However, central to the wide adoption of private woodlots was because the forestry service allowed the innovative farmer unrestricted harvesting of his trees. In similar farmer-managed natural resource regeneration (FMNR) in the Maradi department, there was also need for the entire community to agree to the exclusive rights of the individual farmers to the fruit of their efforts (Weber, 1990). The Forestry Service provided extension advice on thinning out trees. The Bouza village private woodlots on prime land also spread when, some 15 years ago, the forestry service allowed farmers to cut their neem trees. Because of high risks to food crops, a private woodlot is an economic, rational decision. Weber (1990) reports that private woodlots or FMNR is becoming the most widely adopted Nigerian agroforestry practice whose potential is still far from being realized. Around Tahoua, woodlots are in prime agricultural land, but around Maradi they are in degraded soils.

Natural forest management. The Forest Land Use Planning (FLUP) Project of Guesselbodi National Forest has successfully rehabilitated a degraded forest. Central to this success was the organization of local communities into cooperatives by CLUSA, a private voluntary organization (PVO), the wresting from the state of local control over land use, and the cooperation of the forestry service in designing and monitoring a forest management plan. Village participation applied the notion that villagers will effectively participate in programs that they feel are in their best interest and in which they have been included from the beginning (Heermans, 1987)⁴ The forest management techniques include plantation of local species, soil and water conservation structures, controlled cutting of trees, and controlled grazing. These techniques resulted in increased production of wood, forage, and other products; better wildlife habitat; and improvement in microclimatic environment. Villagers have the right to exploit forest products but must sell them to the cooperative, which deals with traders or other non-cooperative villages.

⁴ Heermans, John G. 1987 *The Guesselbodi Experiment: Bushland Management in Niger*. Niamey, Niger: FLUP, USAID/Niger, March.

The FLUP success remains confined to the forests it managed. To duplicate its success in other natural forests, similar efforts must be made in changing property rights to forests, organizing and giving formal legal authority to local communities, changing the role of forestry services, and developing NRM techniques appropriate to local conditions. These efforts have to be tailored to the local conditions.

A6. Agroforestry

Agroforestry incorporates shrubs and trees in farming system management to improve crop yields, generate multiple products (food, fodder, wood, and medicines), and conserve soil and water. Agroforestry is a land-use system, combining forestry activity with crop or/and animal production on the same piece of land (Weber and Hoskins, 1983). Agroforestry techniques⁵ include cropping under sparsely distributed indigenous trees, intercropping with planted treecrops such as in "alley cropping" (when trees are young and do not provide too much cover), and use of windbreaks or live fences on farmlands. Traditionally, African farmers have grown crops mixed with forest trees, in a farm-park landscape (*savane-parc*), associated with livestock raising, in an agro-sylvo-pastoral system. Throughout West Africa, *Acacia albida*, a leguminous tree, is known to increase millet and sorghum yields, conserve soils and provide fodder in the dry season. Contrary to most other trees, *Acacia albida* grows its leaves in the dry season and loses them in the rainy season.

Key points

- Agroforestry, as intercropping, offer lower risks than uniform systems, such as pure stands of crops and tree plantations.
- Uncertainty over land and tree tenure reduces farmers' incentives to engage in agroforestry.
- Agroforestry projects, however, are difficult to administrate because they involve several line ministries.

Illustrations

Mali

Because the traditional land tenure system gives rights to land users planting trees, renters are often prohibited from planting trees on the land they use.

Niger

Acacia albida. A 19th century Zinder's sultan forbade the cutting of *Acacia albida* under the threat of beheading culprits. As a result, the density of *Acacia albida* around

⁵ Weber and Hoskins argue that the concept is often used indiscriminantly, though they recognize that "it is not easy to determine the exact lines of the term."

Zinder is reported to be the highest in Niger (McGahuey, 1989). In the Dosso area, an UNSO project, taking from a previous project, continues to pay farmers to plant and protect *Acacia albida* in their fields. Survey results show that farmers lack enthusiasm in the work and that only 10 percent would continue without project support.

Maggia Valley Windbreaks. Since 1975, over 400 km. of windbreaks protect 4,000 ha in the Maggia Valley (Tahoua region). CARE (a PVO), the Peace Corps and the Nigerian Forestry Service helped develop the practice and establish the necessary institutional framework for this successful project. Grazing was forbidden for four years, while young trees were growing. Tree tenure was granted to individual farmers. However, benefits from planted trees were allocated to individuals and to the community at large, to reduce the cost of policing against the degradation of windbreaks and the free rider problem.

B. Soil Conservation and Fertility Enhancement

The idea of sustainable agriculture is not new, but its concept is still young compared to the time it will take to explore and fully understand its basic principles (Lockeretz).⁶ The concept is also viewed differently by different people. To provide a common ground for discussion, the American Society of Agronomy, in 1988, proposed the following, all-encompassing definition (Lockeretz):

"A sustainable agriculture is one that, over the long term, 1) enhances environmental quality and the resource base on which agriculture depends, 2) provides for the basic human food and fiber needs, 3) is economically viable, and 4) enhances the quality of life for farmers and society as a whole."

Sustainable agriculture covers an extensive range of NRM systems, including rainfed and irrigated cropping systems management, agroforestry, and range management. It is widely accepted that sustainable agriculture will be achieved through changes in the socioeconomic environment and users' attitudes. The socioeconomic environment must be altered to provide incentives for widespread adoption of better NRM techniques. Natural resources users' attitudes toward, and appreciation of the environment must also change to resist sacrificing long-term prospects for short-term gains.

In SSA, SCaFE practices are at the heart of sustainable agriculture. Soils are degraded and water resources wasted by inappropriate practices that compound or contribute to desertification and climate change. A detailed taxonomy for SCaFE is being developed by DESFIL to facilitate the identification and selection of sustainable natural resource management strategies (Fiebig, forthcoming). This section examines, in broader terms, policies measures put in place to encourage natural resource management practices, particularly SCaFE.

⁶ Lockeretz, Williams, *Open questions in sustainable agriculture. American Journal of Alternative Agriculture*. Volume 3, Number 4.

B1. Tenure and Decentralization

Severe constraints to the widespread adoption of sound NRM practices in SSA are linked to land tenure and decentralization issues. Landless farmers are mostly foreign to SSA, but African tenure systems remain ill-defined and insecure. A major cause of this insecurity rests with the complicated mix of the state's property rights, traditional customary ownership, and the pull of market forces. In Francophone countries, for example, tree tenure, even in farmland, is vested in the state. Producers of irrigated, valuable lands in public-financed projects may have no title to plots they cultivate. In traditional communities, although land is inherited from father to sons, only its usufruct is granted to individuals. Long-term investment, for example tree planting, on traditional rented land is discouraged, for fear the tenant will lay indefinite claim to the land. Despite underdeveloped land markets, market forces are pushing commercial farmers to seek individual, private property rights. Formalizing common property tenure systems, which delineate the proper roles of the state and local communities, offers prospects of better, sustainable NRM in SSA.

Key Points

- Tree tenure in Francophone Africa discourages sustainable agroforestry practices (see forest codes in forest management).
- The insecurity over the distribution of resource rights among African farmers and herders promote social conflicts and accelerated exploitation of resources by both.
- This uncertainty in turn, is caused not only by the concentrated resource rights in the hands of the state relative to individuals and communities, but also by the inability of the state and communities to enforce rights of ownership (The Green Book).
- Without legislation regarding private ownership of land, there will be little long-term investment in environmental protection in individual private lands. African states, however, fear that such rights and the development of a farmland market would lead to skewed land distribution and eventually landlessness (Shaikh, et al, 1989). Except tree tenure on farmers' fields, much remains to be sorted out in private property rights and the development of a land market in SSA.
- State-dominated cooperative movements, which were supposed to tap into and modernize the African community tradition, have failed in most of SSA.
- On the other hand, legalizing farmers' associations, grouped by affinity or economic interests, have resulted in increased farm income and farmers' adoption of NRM practices.
- Decentralization and empowerment of local populations in natural resources management constitute a long process that requires careful stakeholder analysis. The process may be viewed as a threat to traditional leadership because many

African traditional community structures remain autocratic, often restricting individual initiatives (Hannah, 1992).

- Landscape-based management systems, such as *terroirs villageois*, apply more to sedentary farmers than to nomadic pastoralists who do not fit easily inside the boundaries of *terroirs villageois* (Shaikh, et al, 1989).

Illustrations

Mali

Village Associations (VA). The USAID-financed *Operation Haute Vallee* (OHV) project, with the assistance of CLUSA, helped develop village associations based on the local *ton* tradition. These successful village associations now negotiate directly with private banks for access to credit to buy farm inputs and implements for cotton and cereal production. Training and information through the VA helped farmers adopt better SCaFE practices in the project area.

Niger

State-Dominated Cooperatives. Niger's National Charter has instituted cooperatives within the Development Society scheme following a top-down approach. Cooperatives are created at all levels (local, regional and national) with designated heads (Thomson, et al, 1989). Farmers have stopped going to these cooperatives once input and credit subsidies were eliminated. With CLUSA's assistance, the FLUP-project created a more effective forest cooperative with democratic representation.

B2. NRM Technology Development and Transfer

Agricultural productivity remains extremely low in SSA. The region's weakness in the development and transfer of technologies to increase agricultural production, at levels comparable to LAC and Asia, is a major factor in its food and development crisis. The "Green Revolution" has largely bypassed SSA. Research results, even when promising, have not been extended to natural resources users. Key determinants of elements of technology development and use include the characteristics of technology, long-term public commitment to research, stewardship (information, credit, distribution), and economic incentives to encourage the use of NRM practices (see section on sectoral policies). This section draws heavily on Shaikh, et al, 1989, *The Segou Roundtable*.

Key points

- Past efforts in technology research and development in SSA were biased against indigenous NRM practices, which were viewed as rudimentary.
- Several examples of successful models of community management of resources do exist in SSA, but these models have been localized.

- Indigenous knowledge, although it may not be sufficient by itself to promote sustainable agriculture, must be integrated, and local people must participate more in the development of technology. This process is key for technology to fit local conditions and be effectively adopted.
- Because of inappropriate incentives, the sound NRM practices used in common fields by local populations are often not adopted in private fields, slowing the widespread use of NRM practices.
- Even the proven NRM practices used in common property lack a sustainable incentive structure. Food-for-work, widely used throughout the Sahel, has shown considerable limitations.
- Private sector's participation in the development, use, and distribution of technology is being encouraged. However, because appropriability of benefits depends of the type of technology, the private sector's participation may be strong for mechanical technology (e.g., farm equipment), biological (e.g., hybrid seeds), and agrichemical technology (e.g., plant protection) technologies, but weak for managerial technology (such as agronomic practices involved in SCaFE).
- Because the private sector lacks interest in managerial technology, promotion of most NRM practices, through extension and training, may be best accomplished by public institutions and NGO/PVOs.

Illustrations

Cameroon

NGO/PVO (McKay, 1990. Cameroon Case Study). The economic crisis in Cameroon has forced government and donors to reevaluate the preeminent role of the state in economic development. The number of NGO/PVOs has remained small in Cameroon because local NGO/PVOs face an unclear legal status and international NGO/PVOs must account for the high costs of living in Cameroon. NGO/PVO relationship with the government still appear tentative, with NGOs unwilling to question government policies on sensitive issues, such as in land tenure.

Private sector distribution of fertilizer. The USAID-financed private sector distribution program resulted in reduced waste, lower transaction costs, and more timely use of fertilizer by cash crop farmers.

Guinea

Traditional NRM management⁷ Guinean Fulbes in the Fouta Djallon highlands classify soils according to fertility and potential use divided into gardening, tree and other crop production, and grazing. For example, soil types/land uses include "workable, but exhausted soils," hillside slopes, compacted clay soils, and crusted laterite. The fertility of gardens is built through time by organic fertilizer (animal manure, household wastes, ashes and mulching with leaves from forest trees).

Traditionally, populations in the Fouta Djallon highlands used live fences to protect gardens. NGOs and development projects have introduced exotic trees, which many farmers have adopted. However, farmers were not trained in the management of these trees, which are allowed to grow without pruning or coppicing.

Research in alley cropping (Agroforestry). A Belgium-financed project is conducting research in alley cropping, using rows of trees (e.g., acacia and leucaena), and in the alleys forage species, vegetable crops, and green manure crops.

NGO/PVO. The small number of NGO/PVOs present in Guinea are still at the stage of organizing farmers to gain better access to credit and inputs. Such start-up activities, which address farmers pressing needs, are necessary to establish the NGOs in the community.

Madagascar⁸

NGO/PVO. Donors (including USAID and the World Bank) are increasingly paying attention to NGO/PVOs in Madagascar. Preliminary results of a FAO study indicate that involvement of NGOs may have improved the sustainability of some NRM projects in Madagascar. The USAID-financed KEPEM project aims to create a favorable environment for more effective collaboration between NGOs and their partners, local associations and individuals, in the management of natural resources (USAID/Madagascar, KEPEM project).

Several organizations have recently been created in Madagascar in relation with the country's NEAP, notably to improve the collaboration with NGO/PVOs. A mixed public/private institution, the Association for the Management of Protected Areas (ANGAP), is working with NGOs in the area of protected areas and biodiversity. Another mixed public/private institution, the National Association for Environmental Action (ANAE), is

⁷ Gaudreau, Martha, Peter Gilruth, G. Edward Karch, Karen LeAnn McKay, and Barton Sensenig, 1990. *Guinea Natural Resources Management Assessment*, Washington, D.C.: Natural Resources Management Support Project, Energy/Development International.

⁸ Discussions based on: USAID/Madagascar, 1992. *Madagascar KEPEM NPA PAAD* (clean version), and McKay, Karen LeAnn and David Gow, principal report and case studies with Christine Brown, Kjell Christophersen, Elizabeth Gaylord, Ken Koehn, Karen LeAnn McKay, and Chris Seubert, 1990. *Enhancing the Effectiveness of Governmental and Non-Governmental Partnership in Natural Resources Management*, Washington, D.C.: Natural Resources Management Support Project, Energy/Development International.

funding NGOs in NRM/development projects. In 1989, the USAID-financed NRM NGO/PVO project encouraged the creation of a federation of NGOs to reduce transaction costs in dealing with the increasing number of NGOs, which now reaches 400 (Brown, personal communication). COMODE, the *Conseil Malgache des ONGs pour le Developpement et l'Environnement*, which groups some 40 NGOs, has established itself as such a key organization.

Mali⁹

Incentives for Water Conservation Techniques. Farmers at Foussebougou (Sikasso region) were trained in the construction of diversion bunds to reduce gully erosion by the Farming System Research project. Farmers accepted to construct such bunds above and outside their fields, but not in their fields. It is not clear what are the disincentives for farmers to engage in NRM in their individual fields.

Small rock dams initiated by a religious mission near Bamako recharged the aquifer and allowed rice and sorghum growing. The existence of water also attracted herders, whose cattle sometimes damage crops. Villagers provided labor and the religion mission the hardware. The failure of one dam illustrates the limited technical skills available to PVO and villages in site selection and dam construction. Increased rice production attracted farmers to repair the broken dam but they lacked the skills to do it.

Research in SCaFE. USAID and other donor-financed projects have initiated research and demonstration efforts in composting as an alternative to inorganic fertilizer. Preliminary information indicates that because of the large amounts required to fertilize soils, composting is likely to have more impact on cash crops than food crops (Shaikh, et al, 1988).

An innovator in Djenne obtained usufruct rights to degraded land nearby a river, and gradually improved its soil fertility and developed a commercial garden. Another farmer is copying his experience. Land rights may become harder to obtain because of the changing expectation of land value. Innovators, with experience (such as live fences) gained outside their communities, take advantage of economic opportunities to introduce NRM practices that others can imitate. How to reinforce the resolve of these innovators, is a key issue in many SSA countries. Training, technical and managerial assistance have proved instrumental.

Extension and Information. IUCN, the Canadian Center for Studies and Cooperation (CECI), CARE-Mali, and Malian Forestry Service are sponsoring an illustrated magazine, *Walia*, which is distributed to 25 schools in the Niger Delta. *Walia* has achieved a strong readership beyond the area; the 4,000 copies are passed and read throughout Mali. The magazine, as similar ones in East Africa, is raising consciousness about natural resources conservation.

⁹ Discussion based on Asif Shaikh, Eric Arnould, Kjell Christophersen, Roy Hagen, Joseph Tabor, and Peter Warshall *Opportunities for Sustained Development: Successful Natural Resources Management in the Sahel*. Washington, D.C: Energy/Development International, International Resources Group.

NGO/PVO. International NGO/PVO activities began in 1972, at the start of the Sahelian drought (Koehn and Seubert, 1989). More came to Mali after the 1984 drought, bringing the number of NGO/PVO to 155 in 1989. Mali instituted, 7 years ago (Brown, personal communication), a body coordinating NGO/PVO activities, the CCA/ONG (*Comite de Coordination des Actions des Organisations Non-Gouvernementales au Mali.*) A legislation, *Accord Cadre*, was instituted to legalize the activities of NGO/PVOs. These NGOs/PVOs are credited for arousing local population's consciousness regarding natural resource degradation and management.

Niger¹⁰

Research in Water Conservation. Donors have financed several experiments in water and soil conservation projects in Niger. The USAID-financed FLUP project conducted research on many types of soil and water conservation techniques: V-shaped water-harvesting catchments, contour bunds, and grids of earthen bunds. These practices allow more water infiltration and reduces runoff and erosion downstream. Aquifer recharge and vegetative growth is increased. Water harvesting catchment techniques in the FLUP project were shown to increase crop yields, survival of tree seedlings, and high financial returns on agroforestry (tree-crop association) systems.

Incentives for Water Conservation. In a Swiss-financed project, initiated in 1976 by a priest who had lived in Niger since 1967, villagers have been paid food aid to build similar catchments, starting in 1980. Other Swissaid projects have used food-for-work to help villagers construct water catchments. In one nearby village, a farmer has initiated, on his own, water catchment technique on his farm. However, Shaikh (1988) reports a large percentage of failure in one area of the Swiss project, because of poorly designed "protective" diversion bunds (by the public Rural Works agency) and improperly constructed bunds and lack of maintenance by local populations. The failure shows that both public agencies and local populations need training in the design and construction of water catchment structures. Food aid or food-for-work has been justified on the ground that farm households need compensation for lost income they could earn during the off-season. Food-for-work, however, has limitations in the long-term¹¹.

The 7-year, Italian-financed Keita integrated rural project is one of the largest soil and water conservation (SWC) components in Niger. Food-for-work is provided to farmers to dig trenches for water catchment upstream before the project helps with contour bunds along contour lines, using heavy equipment and skilled labor, on farmers fields downstream.

¹⁰ Discussion based on Asif Shaikh, Eric Arnould, Kjell Christophersen, Roy Hagen, Joseph Tabor, and Peter Warshall *Opportunities for Sustained Development: Successful Natural Resources Management in the Sahel*. Washington, D.C: Energy/Development International, International Resources Group.

¹¹ For example, Joyce and Burwell (1985) note that "few dispute that community motivation and participation can become dependent on food aid," in *Community-Level Forestry Development: Options and Guidelines for Collaboration in PL 480 Programs*. Moreover, many food-for-work projects are ill-designed and poorly implemented.

Despite its high cost, it is hoped that the project has good replicability. Across Niger, it appears that food-for-work in NRM has become a way to disperse food aid.

Other soil and water conservation practices include the FLUP gully erosion checkdam and the Swiss-financed channel protection dams. The benefits of such structures, which usually reach large communities, are not as immediate and tangible as others, so that villagers are reluctant to undertake them, unless they are compensated. The Swiss-financed project used food-for-work and the FLUP hired workers to build the structures.

Incentives for SCaFE. To regenerate the Guesselbodi forest, the FLUP applied several SWC techniques. Contour walls proved effective but costly. Such a technique is cost effective as a cropping management practice that increases yields, allowing farmers to realize direct benefits and incentives to use them without outside remuneration. Mulching techniques were used instead to increase organic matter and allow regeneration of grasses, shrubs and trees.

Sectoral Policies

Arguably, agriculture sector policies include the specific NRM policies that were addressed above. It helps, however to make this distinction, for sector-wide policies have a larger focus and more competing objectives, the reconciliation of which has often been detrimental to natural resources conservation. In SSA, as agriculture and livestock systems compete for soil and water resources, they often generate social conflicts because they are managed by groups with different ethnic backgrounds or different ways of life. Many development programs have attempted to develop the complementarity between the two systems, but there exists a different set of policies that affect differently agriculture and livestock/range management.

C. Agricultural Policies

The Green Book policy taxonomy includes all major agriculture sector policy measures, pricing, agricultural credit, direct government intervention, and regulation of pesticides pertinent to SSA. Other key areas of agriculture sector policies were examined in the section about soil conservation and fertility enhancement (research and extension) or about macroeconomic policies (trade and export promotion).

Key Points from the Green Book

Product pricing

- The nature of the linkages that run from producer prices to agricultural production and effects on natural resources is not yet clearly understood.
- Price policies that depress agricultural product prices also reduce investment in conservation and decrease rural employment and income. With low agricultural

prices, however, if producers have other alternatives, farmland can be left idle, enhancing resource conservation.

- Production increases from increased prices may come from more intensive agricultural systems, expansion of cultivated area, changes in cropping mix, or all of the above. These responses have different environmental and welfare effects.
- Increases in agricultural prices to farmers need a complementary set of policies that address tenure, education, technology, and credit in order to successfully deal with environmental issues.

Input pricing

- Subsidized agricultural inputs can result in adoption of technology in the short-run but, if left too long, result in inefficient use and skewed production decisions in the long-run.
- Agricultural credit often favors large borrowers and commercial enterprises to the detriment of smallholders. This can result in pressure on fragile lands.
- Credit policies often favor capital over labor intensive investment and the use of agrichemicals over the adoption of conservation practices, such as integrated pest management (IPM).
- Pesticide subsidies can result in wasteful applications, often by large, commercial operations.
- Fertilizer subsidies have resulted in increased production, but also in decisions biased against the use of organic fertilizer.
- Similarly, farm machinery subsidies have also favored large commercial producers and resulted in decisions biased toward capital and against labor. Such effects contribute to rural employment problems.

Government direct intervention

- The impact on natural resources of government direct intervention in the agricultural sector can be quite diverse.
- If public operations in input distribution are effective, input-intensive practices are promoted over perhaps low-level input, more conserving practices.

Regulation of pesticides

- Policies regulating the importation and use of pesticides are generally not enforced because of inadequate institutional resources.
- Poor policy enforcement has allowed contamination of soil and water, worker poisoning and consumer endangerment.
- Pesticides are often applied in excess of recommended levels and without proper safety precautions because of user ignorance or carelessness.
- Policies that regulate pesticide residues of imported products are more effectively enforced in industrialized than in developing countries.
- Increased production of cash or export crops is often achieved through greater use of pesticides.
- However, by increasing agricultural productivity, pesticides can also reduce pressures to expand agriculture into forested area.

D. Livestock/range Management

Traditionally, pastoralist societies in the semiarid lands of Sahel and Southern Africa efficiently managed natural resources through the rotation and transhumance of herds, and adequate spacing of wells controlled by individuals or groups. In Botswana, wells are still kept a walking-day apart. In the Sahel, pastoralists and agriculturalists commonly had a symbiotic relationship, where herders got access to crop residues and grain in return for manuring farmers' fields. As they established numerous, close-by public wells free for all, creating an open access resource, and provided better, often subsidized animal care, contributing to growing herds, government livestock policies led to extensive overgrazing. The introduction of private wells and fencing, for example in Botswana, contributed to the breakdown of the traditional range management system. The veterinarian-dominated livestock ministries in West African Francophone countries have been often accused of lacking livestock policies apart from the provision of animal care and taxation.

As they fight against ever-expanding farmlands and over-restrictive public forest reserves, Sahelian pastoralists still attempt to reclaim their traditional rangelands, but they clearly lack the incentives to preserve the natural resources on which their survival depends yet over which they have lost control. For centuries throughout SSA, nomadic and pastoralist populations have been locked into livestock raising as a way of life. Increasingly in many Sahelian countries, livestock production has become also the better economic opportunity for most rural as well as urban populations with savings to invest.

Livestock management in SSA, however, remains fundamentally different from that of LAC, which is comparatively more large-scale, intensive, and modern commercial

operations. Therefore, livestock policies SSA and LAC tend to be fundamentally different. The section draws heavily from Thomson,¹² et al, 1989.

Key points

- Property rights over competing range and farmland, and access to forests favor more sedentary agriculturalists than nomadic pastoralists, resulting in social conflicts and degradation of natural resource management.
- Control over wells granted to pastoral groups helps restore efficient natural management of natural resources.
- Government policies may succeed in expanding herds but have often failed to reduce livestock population because African pastoralists view animals as a store of wealth and an important token of social status.

Illustrations

Guinea

To avoid livestock taxes in the past, herders in Fouta Djallon highlands had stopped gathering their animals on farmer fields to thwart any attempt at estimating their herds. This behavior eliminated the traditional night parks and made manure gathering much more difficult for farmers and gardeners. Even today, herders scatter their animals to make their count more difficult (Gaudreau, 1990).

E. Macroeconomic Policies

In drawing lessons from LAC, Asia, and Africa, Johnston, et al, 1992 note in the *Green Book* that "systematic study of the interactions between macroeconomic policies and natural resource management is a new area of inquiry. Similarly, accounting for the effects of natural resources management on macroeconomic outcomes is at an incipient stage. Unlike studies of the effects of structural adjustment programs on the poor, the conclusions about the net resource consequences of macroeconomic policies are not clear." Macroeconomic policies change the tradable/non tradable production mix, agricultural/non agriculture terms of trade, export/import trade balance, and, more and more in SSA, the mix of public/private sector activities, including technology development and use. In most part, the impact of macroeconomic policies on natural resource management is not direct, nor immediate. Macroeconomic policies, in conjunction with sectoral policies, alter the incentive structure faced by users of natural resources (including farmers, animal producers, agribusinesses, and manufacturing industries). Also, macroeconomic policies require

¹² Thomson, James T., Alfred Waldstein, Sheldon Gellar, and Jerry Miner, 1989. *Options for Promoting User-based Governance of Sahelian Renewable Resources. Paper prepared for the CILSS-sponsored conference, "Regional Encounter for a Better Socioecological Balance in the Rural Sahel" Mali, March 13-20, 1989.* Associates in Rural Development.

considerable lead time to take effect, especially as policies are often politically difficult to fully implemented.

Studies note that in SSA, the macroeconomic effects on agriculture can be more important than the direct sectoral measures (Kruger, et al, 1988). Governments and policy analysts should pay more attention to macroeconomic policies and their effect on agriculture. Devarajan estimates that the fixed exchange rate of CFA franc relative to the French franc, have served Francophone African countries well until recently. Since the 1980s, however, because individual countries are denied the option of devaluation, these countries have experienced lower economic growth compared to other African countries.

African economies have lost their competitive edge because of labor policies. Coupled with the high value of CFA franc, civil servants and formal labor employees in Francophone countries enjoy salaries higher than in neighboring anglophone countries. High wage policies favor urban, formal sector employment, and expectations of urban wages, partly fuels rural-urban migration.

SSA countries are implementing structural adjustment and stabilization programs, which include macroeconomic and sectoral policies. The goal of these programs is to set the right conditions for broad-based, market-oriented economic development. To a level unprecedented in SSA, these programs encourage the participation of private initiatives and the reduction of public intervention in the economy. These programs need to selectively address issues that have implication for the management of natural resources.

Key points

Monetary, Credit Policies, and Wage Policies

- The expansion of money supply and inflation discourages long-term investment and encourages short-term economic activities, which result in resource mining.
- High real interest rates discourage long-term investments in natural resource conservation.
- Banking and credit regulations affect the availability of credit and interest rate in the economy.
- Governments must intervene in monetary and credit policies to steer economic development. The appropriate time of intervention and the mix of measures, however, are difficult to set, as often is also the political will to bring to bear.
- Labor rules and regulations in Francophone African countries have resulted in high wages in the formal, usually urban-biased sector.
- High urban wages fuel urban-rural migration, which results in seasonal labor shortage and extensive, less conserving, natural resource management.

- High wages in agricultural export activities reduce competitiveness of Francophone African countries relative to others in Africa and outside, especially Asia and Latin America. With the slump in agricultural export sector, African producers have shifted to local foodcrop production.

Fiscal Management Policies

- Fiscal deficits limit the ability of governments to provide services needed to protect the environment and natural resources management.
- Financing fiscal deficits by domestic credit borrowing increases inflation, reduces the availability of credit for private sector activities, limiting long-term investments in soil conservation.
- Foreign debt payment reduces foreign exchange and puts pressure on countries to expand exports. The drain in foreign exchange limits funds available for firms to import technologies needed to improve efficiency and increase production.
- Cuts in capital expenditures to maintain current expenditures (salaries and wages) result in lower productivity, food deficits, and reduced exportable commodities, and a decline in foreign exchange earnings.
- Revenues from various resources management related taxes and fees are inadequate because of poor administration and failure to capture the economic gains or rents that should accrue to the government.

Trade and exchange policies

- The overvaluation of domestic currencies is an implicit subsidy for imports and an implicit tax on exports. This contributes to skewed prices against the agricultural sector compared to other sectors. This results in increased rural unemployment and underinvestment in resource conservation.
- Devaluation shifts production in favor of export crops, which may increase pressure on natural resources by more intensive use of soils or expansion into marginal lands.
- Devaluation will be short-lived unless accompanying measures to maintain a lower real exchange rate are carried out.
- Trade and investment promotion policies by encouraging short-cycle, nontraditional exports, increase the use of chemical fertilizer and pesticides, with potential harm to the environment; however, the elimination of subsidies by raising the costs of these chemical inputs should mitigate about their increased use.

SECTION V

CONCLUSIONS: INFORMATION NEEDS AND GAPS

There is much more existing information than what was reviewed here to illustrate the applicability of the Green Book to the five selected Francophone African countries. Nonetheless, as limited as the review may be, it points to issues that clearly need detailed inquiry. DESFIL can help bridge these gaps, through the implementation of its research agenda and an emphasis on policy and institutional reform analysis, technology development and transfer study, information dissemination and arousal of users' consciousness about environmental conservation and related economic development. Some of these information needs and gaps are specific to countries and will be examined country by country. Other issues are broader and will be briefly discussed below.

One broad issue is how to go from localized success to larger-scale use of NRM practices? Which conditions are specific to local situations (for example, the key role of a charismatic leader or a bold innovator's activities) and which conditions have broader applicability?

A related issue is how to move from the NRM practices successfully demonstrated on the village's common field to their widespread adoption by farmers on their individual, private fields? There is need to clearly understand how types of property (common, open access, private, state-owned) and risk avoidance strategies may determine which techniques are applied by users. Natural resources users edge their bets when they engage in NRM practices with variable short-long costs and benefits. Risks that are shared when groups work on the village's common fields are often too high for one individual to bear.

Another important issue is how to come to grips with the role of the private sector, not only farmers' cooperatives, but also individual commercial farmers (for example, in nontraditional export crops production), processors, transporters, and input distributors? How to reconcile the new "social contract in NRM," which is being forged among the state, local institutions, and NGO/PVOs in SSA (Shaikh, 1989), and the increased market liberalization and private sector's participation, which are the core elements of the structural adjustment policies pursued by these countries? The role, if any, of the private sector in NRM needs to be openly discussed.

Country-specific information needs and gaps and how can DESFIL can contribute to bridge them are briefly examined below. DESFIL policy and soil conservation and fertility enhancement (SCaFE) taxonomies are viewed as analytical tools designed to help the Africa Bureau and USAID field missions engage in fruitful dialogue with host-country authorities, local communities, and NGOs/PVOs for the purpose of designing, implementing, and monitoring NRM programs and projects. The present analysis is preliminary in nature, mostly because information that already exists was not available to the author at the time this

document was written. Therefore, the suggested research focus for the five Francophone African countries remains illustrative.

A. Cameroon

DESFIL ecozone: Tropical humid lowlands. Cameroon is one of the few countries in USAID NRM Group I and II countries with a significant humid forest ecosystem. Moreover, Cameroon contains the major ecozones of SSA, so that within its borders, one could study the fit or lack of it, between national policy measures and NRM in different ecozones.

Research themes: Natural forest management and sustainable agriculture. Tropical rainforest degradation results from intense logging, encroachment of smallholder farmers, plantation agriculture, and road construction. It is estimated that annual deforestation from agriculture alone amounts to 100,000 ha annually (USAID/Cameroon, 1989). This degradation has negative impact on animal and plant diversity. No attempt has made to encourage the participation of local communities in the management of natural forests. At the same time, past agricultural policies adversely affected the profitability of tree crops, which have implications on the protection of natural resources. Farmers may lead farmers to switch to more extensive, natural resources-degrading foodcrop production.

Research issues: Economic policies, property rights, technology. USAID/Cameroon's strategy stresses policy and property rights changes (concessions) and agricultural practices in forest management and controlled use of fragile lands and buffer zones. There is limited information, in the literature reviewed, about the impact of the duration of concessions on forest management, the success or failure of natural regeneration of the moist forests, the impact of farmland encroachment, and community's management of forests. There is also need to analyze the impact of economic policies on the crop mix and subsequent SCaFE practices used by farmers that grow export and local food crops. USAID/Cameroon has been unique in emphasizing the institutional approach to development. For example, it was deeply involved in the implementation of the liberalization of the fertilizer subsector and helped in the drafting of the cooperative code for cashcrop farmers after the collapse of the coffee and cocoa marketing board. To what extent does reduced fertilizer subsidies and the participation of private distribution change farmer's use of fertilizer and alternative practices improve natural resource management?

B. Guinea

DESFIL ecozone: Steep slopes. Guinea was selected for because of hilly slopes of the Fouta Djallon Highlands. However, the country presents a diverse range of ecosystems, although not as rich as Cameroon.

Research themes: Sustainable agriculture and forest management. In the high valleys of the Fouta Djallon Highlands, slash and burn cultivation and overpopulation have created erosion and soil fertility problems in many producing areas. These problems have implication for watershed management. Forests in Guinea are not as degraded as elsewhere

in West Africa, but the capacity of Guineans to manage these forests may be also lower compared to neighboring countries because of limited human and capital resources. Because of the previous authoritarian regime, there is hardly any tradition of local, effective participation in development projects.

Research issues: Technology, property rights, policy, gender issues. USAID projects in the Fouta Djallon Highlands seek to increase local populations' access and control over land and water resources through agroforestry and conservation practices. Gender issues are important in these areas where women are responsible for agriculture production around compounds and lowland gardens.

Because of poor economic policies and human rights abuse under the previous political regime, Guinea has lost considerable ground in economic development compared to countries with similar natural resources endowment, such as Cote d'Ivoire. Human and financial capital left the country, reverting the country to extensive agricultural practices, though often also reducing human pressure on natural resources. Agricultural policies discouraged agricultural production, despite favorable natural conditions. Also, past sectoral policies, by breaking down traditional livestock management, still adversely affect SCAFE practices.

Guinea is now engaged in more liberalized policies and a democratic process. Which policies have been designed and implemented? What have been resource users' responses to the recent political and economic changes?

C. Madagascar

DESFIL ecozone: Steep slopes. Madagascar's unique biodiversity is threatened by degradation. The country also faces severe soil degradation on its steep slopes.

Research themes: Sustainable agriculture. Madagascar has gone from being a traditional self-sufficient producer to an importer of rice in recent years. Inefficient cultural practices coupled with high population growth, have resulted in the cultivation of fragile lands, leading to massive degradation of the island's highland slopes.

Research issues: Technology, policy. The poor performance of the rice subsector is explained by inappropriate technology and government policies. USAID's programs emphasize better techniques and incentives to increase yields and reduced pressure on fragile soils and watersheds.

The development and use of DESFIL natural resource policy and SCAFE taxonomies can shed important light on the evolution of and relationships between government policies and NRM practices on steep slopes. Because of Madagascar's uniqueness, thus far, most NRM studies and programs had emphasized biodiversity, and had relatively neglected the relationships between NRM and agricultural development. Madagascar is undergoing profound political and institutional changes that have strong implication for local management

of natural resources. The rapid growth of NGOs holds promises of increased participation of local population in natural resource management.

D. Mali

DESFIL ecozone: Semi-arid zone. Mali is selected to represent Sahelian countries.

Research themes: Forest management, sustainable agriculture, indigenous peoples. Forest management for fuelwood production and sustainable agriculture are major problems in Mali. As in other Sahelian countries, management of natural forests is now favored over large scale public forest plantations. USAID has funded several activities to generate and extend better farm practices in the fragile lands in Mali. These activities have helped create successful village associations, which may play a significant role in natural forest management.

Research issues: Technology and property rights, gender issues. USAID seeks to develop techniques to improve agroforestry, prevent soil erosion and reverse the degradation of natural resources. The mission also seeks a policy dialogue in Mali about the rights and responsibilities of the government, local communities and individuals about land, tree and resource tenure. There are important gender issues in natural forest management, as women are traditionally assigned to the collection of fuelwood and many other forest products.

Several NRM studies conducted in Mali already provide a wealth of information on local organizations, cropping systems, and forest management. Mali was host to the important, CILSS-sponsored *Segou Roundtable*, where for the first time a large body of local natural resource users shared directly their views with government officials, donors, and development experts. Despite these accomplishments, the iterative process of designing and implementing policies is still going on. There remains also a sense of scattered information and the gap between localized success and widespread adoption of NRM. Has the increased access to credit by the successful village associations been translated into sustainable agricultural practices? How have the VAs used their effectiveness to resolve land and tree tenure issues, among themselves and with the state? Can these VAs be duplicated outside the cotton cash cropping system of the better endowed southern Mali?

Mali is the repository of a long tradition of interactions between successful pastoralists, farmers, and inland fishermen. Before the French colonization, the Bambara farmers and the Fulani herders had developed an elaborate *agro-sylvo-pastoral* management system. The "Bouna Agreement" may be seen as an attempt to revive such a long-lost cooperation among the various users of natural resources in the Sahel. How was the agreement established? Is it working? How can similar agreements be devised in Mali and elsewhere?

E. Niger

DESFIL ecozone: Semi-arid zone. Niger is the second semi-arid country selected for initial study.

Research themes: Forest management, sustainable agriculture, indigenous peoples. Many observers believe that the management of natural forests by indigenous populations may be more economical than large scale fuelwood plantations that many Sahelian countries undertook in the 1970s. Also the fragile natural resource base in Niger needs to be protected against encroachment of dryland, and extensive cereal cultivation.

Research issues: Property rights, technology, gender issues. The USAID-funded Forest and Land Use Planning project has created the basis for a rural code, which attempts to provide local people with incentives to rationally manage natural forests. Innovative agronomic practices are also needed to increase and sustain the productivity of (inter)cropping systems. There are important gender issues in natural forest management, as women are traditionally assigned to the collection of fuelwood and many other forest products.

Niger, as Mali and indeed the Sahel in general, has been extensively studied. Undoubtedly, because its resource base is weaker, Niger has pioneered interesting NRM practices. The success story of Niger's natural forest management by local populations is well known. However, one former manager of this project (Seve, personal communication) thinks that despite the exemplary framework¹ of this project, its success is still fragile, because of limited knowledge in bushland forest dynamics and lapses in implementing the management plan.

Also as Mali's successes in NRM, Niger's successes in natural forest management and cooperative organization are localized. The ingredients and lessons of sustainable use of natural resources are scattered. What would it take to create strong, effective and democratic cooperatives or alternative users' associations elsewhere? What is the impact on NRM of mobilizing rural savings?

Despite their distinct characteristics, these Francophone countries have similar institutions and legislation, because of the common colonial history. While many policies developed to cope with natural resources degradation would be country-specific, many lessons from DESFIL's study of these policies would have strong applicability across countries.

¹ Seve reports a strong interest from Thai forestry service officials to whom he recommended the Guessebodi's forest management framework (personal communication).

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