

Chapter 4

A Resource-Enhancing  
Approach to African  
Agriculture

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# A Resource-Enhancing Approach to African Agriculture

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## HIGHLIGHTS

- Meeting future food security needs in Africa will require that increased attention be directed toward assisting African low-resource agriculture. This conclusion is based on low-resource agriculture's central position in African economies today, its economic and technical potential to contribute to national and local development tomorrow, and the serious implications of continued neglect of this sector.
- Understanding the diversity and complexity of low-resource agricultural systems provides essential guidance on how development assistance can contribute most effectively to sustainable agricultural development.
- A proposed resource-enhancing approach is complementary to, and in some respects overlaps with, other defined African agricultural development strategies that focus on: 1) basic human needs, 2) the need for policy reform, and 3) targeted development of high-potential, small farms. Differences also exist, however, that have other implications for development assistance.
- A resource-enhancing approach generally is consistent with the views of African scientists and policymakers expressed to OTA.

## WHY FOCUS ON LOW-RESOURCE AGRICULTURE?

Assistance to Africa's resource-poor farmers, herders, and fishers could have a substantial impact on African food security and agricultural development. Thus, low-resource agriculture deserves increased attention from development agencies and African governments [1, 17, 27, 33, 35, 37]. This conclusion is based on four factors:

1. Low-resource agriculture already plays a central, though largely neglected, role in African economies.
2. Economic advantages and widespread benefits can be achieved through focusing agricultural development efforts on Africa's small-farm sector,
3. Low-resource agriculture in Africa generally is efficient, given current availability and dependability of resources and infor-

mation. Known and promising technological opportunities exist to improve efficiency, however.

4. Failing to provide increased support to this sector will likely mean a continued deterioration of Africa's food security, and accelerating degradation of its natural resource base.

Low-resource agriculture, as shown in chapter 3, produces the majority of Africa's food and employs the majority of its people. Historically, however, agricultural development efforts have focused on large-scale farms and ranches, in part to take advantage of potential economies of scale. However, under conditions that prevail in most African countries, the benefits of pursuing "small farm development

strategies involving labor-intensive, capital-saving technologies” are now generally recognized as a more economically viable approach (17).

Also, efforts to promote agricultural development in Africa must look beyond simply elevating aggregate agricultural production and seek the balanced economic growth and social development that will only be provided through increased attention to resource-poor agriculturalists:

In brief, the economic advantages of achieving widespread increases in productivity among a country’s small-farm units derive from the fact that they are the most feasible and cost-effective means of attaining the multiple objectives of development—the growth of output, expansion of opportunities for productive employment, narrowing income differentials, reducing malnutrition and excessively high rates of infant and child mortality, and slowing the rate of population growth (17).

The economic advantages of focusing on a broad-based effort to promote small-farm development derive, in large part, from the heavy dependence on family labor in most African farming systems. Small farms that depend primarily on household labor are more economically efficient than larger scale state or private operations (16,33).

Also, practices of low-resource farmers and herders are increasingly being recognized as

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<sup>1</sup> Economic analyses are often framed in terms of “small farms” and do not address explicitly the effects of such approaches on herders. Some economic arguments appear to apply to the broader group OTA terms “low-resource” (which includes herders) but a definitive conclusion awaits further analysis.

efficient ways to balance scarce resources and meet multiple objectives. However, the existence of compatible technologies and the prospects of providing improved access to inputs and information suggest significant improvements are possible. For example, crop yields probably could be doubled within a decade if improved management practices and varieties that already exist were employed widely (see ch. 5).

Because low-resource agriculturalists are in many cases the principal agents causing the deterioration of the African natural resource base, this group truly needs options to encourage sustainable production. The problem is most acute in regions where farmers and herders are, for lack of alternatives, overworking the land or are forced onto increasingly marginal lands, in many cases leading to serious environmental degradation.

Perhaps the strongest arguments for focusing development assistance efforts on the resource-poor agriculturalists are rooted in humanitarian concerns. Simply stated, failing to direct attention to this group will, in large measure, shut a majority of Africans out of the development process. The threat arises that this group, in terms of production and consumption, may become relegated to “insignificant” elements of national economies that mainly receive attention within the context of famine relief (13). To avoid such a scenario necessarily will require efforts by development assistance agencies, but especially African governments, to more effectively integrate the needs and contributions of resource-poor agriculturalists into national development efforts.

## A RESOURCE-ENHANCING APPROACH TO DEVELOPMENT ASSISTANCE

The following discussion focuses on four concepts that are central to a resource-enhancing approach that might be undertaken with poor

formers, herders, and fishers in Africa. Each concept, in turn, suggests the applicability of particular guidelines for development assis-

tance in support of low-resource agriculture and each is illustrated by a box.<sup>2</sup>

These guidelines for development assistance are derived from a review of development successes and failures. They reflect the need for development assistance to be long-term, dynamic, and well matched to existing conditions. Also, these guidelines stress that to enhance low-resource agriculture, understanding existing systems must precede interventions. Most importantly, the development and application of African skills are crucial for reaching the goal of eventually eliminating the need for most development assistance.

The guidelines outlined here reflect a generally well-accepted view of low-resource agriculture in Africa. In fact, many of the guidelines are already reflected to some degree in existing legislation and official development assistance policy (see ch. 6) and are largely consistent with the views expressed by African experts surveyed by OTA (1; app. D). The guidelines are general because they are intended to respond to the diversity of low-resource agricultural systems and no attempt has been made to list all the ways in which the four concepts could be turned into guidelines. Basically, these guidelines are simple ideas, perhaps obvious ones. However, too often they have been ignored and development assistance has suffered as a consequence. What the guidelines imply for development assistance is addressed in general terms here; chapters 5 and 6 provide additional detail.

<sup>2</sup>The material in this chapter comes from several sources. OTA's Contractor Reports were used to develop an overview of the fundamental concepts underlying low-resource agriculture's management of natural resources, household productivity, and the effectiveness of institutions (10,11,18). OTA also held a workshop to integrate the findings from these papers (app. B) and supplemented this information with an additional contractor report and a workshop summary (app. A). Many other experts participated in the review of the information, but the final synthesis and conclusions are OTA's.

## Agricultural Systems for Africa's Future

**Concept 1: Most African agricultural systems, although once sustainable, are no longer keeping pace with the increased demands being placed on them. Thus, development assistance should be designed to:**

- place a high priority on environmental, technological, economic, social, and institutional sustainability;
- acknowledge the importance of sound natural resource management as a basis for improved and stable agricultural production; and
- acknowledge that resource-poor agriculturalists are the primary custodians of their resources, and therefore ensure that they benefit from development assistance to manage natural resources better; and
- focus on enhancing the capability of Africans to assume primary responsibility for their development as the surest route to sustainability.

Sustainability of agricultural production systems should be a paramount objective for African agricultural development. Sustainable agriculture is a concept that has received considerable attention in recent years, but one whose criteria remain inadequately defined. Agreement on some fundamentals of the concept is growing, however. Sustainability of agriculture should be approached from various perspectives—environmental, technological, economic, social, and institutional. It is generally recognized that for agricultural development to be sustainable it must consider all these dimensions as well as their interaction (22,23).

Sustainability is fundamentally a temporal consideration—a condition of viability over time. It means, for example, not only that a technology is affordable today, but that costs and upkeep remain affordable tomorrow, or until replacement or upgrading becomes cost-effective. Institutional support services (e.g., for repair, distribution, or financing of inputs—as

### Box 4-1.—Turning the Tide at Guesselbodi

The Sahel is not an easy place to make a living, but people have been doing so for as long as 600,000 years. The region is characterized by sparse, erratic rainfall and what some scientists suggest is a cyclical pattern of drought every 30 years or so. Farming and especially herding activities are closely aligned to these fluctuations. With sufficient rainfall, farmers have extended their activities into drier areas and herders increased herd size and altered herd structures (e.g., increasing numbers of cattle relative to more drought-tolerant camels and goats). When drought set in, the pattern has historically meant a retreat to wetter areas and a shift to more drought-resistant crops and livestock. However, population growth in the region, among other factors, has made it increasingly difficult to revert back to the areas of higher and more dependable rainfall. The consequences are increasingly severe. After almost three decades of below-normal precipitation, a once gradual process of declining productivity and loss of biological diversity has now accelerated in many regions to the point of disrupting ecological processes essential to sustainable development in the region (29).

The impacts can be readily seen around the Guesselbodi Forest in eastern Niger. Guesselbodi was designated a national forest reserve in 1948. But authorities have been unable to prevent local populations from overexploiting the forest and land, through deforestation, overgrazing, and unsustainable farming practices. An estimated 40 to 60 percent of the forest cover was lost between 1950 and 1979, leaving behind barren land largely denuded of topsoil (15). Strong pressures also emanate from Niamey, Niger's capital, about 25 kilometers away. Niamey's population grew from 7,000 in 1945 to 300,000 in just 25 years; and with its growth came demands for food and fuel from surrounding areas. The result has been an ever-widening ring of degraded land around the city, as once viable pasture and farmland are left crusted and barren. It has become increasingly apparent that in order to meet the needs of existing residents, let alone the projected increased population, a more sustainable approach to exploiting the region's natural resource base is needed. Further, greater effort also must be directed to reclaiming land already degraded.

Guesselbodi is one place where development focuses on turning back the tide of environmental degradation. It is the most advanced of a number of similar pilot projects in Niger's Forestry and Land Use Planning Project currently funded by AID. A research and management plan was developed in 1983, based on soil and topographic surveys and inventories of vegetation and forest resources. The aim is to promote systems whereby multiple uses of the forest resources could provide sustainable benefits to the surrounding communities—e.g., fuelwood, poles, forage, honey, medicine, food, and income:

The idea was to test simple, small-scale, low-cost rehabilitation measures that could be carried out by villagers. The first plots were covered with water harvesting and water spreading structures: microbasins, earth banks, stone lines, rock dams to divert flash floods from gullies onto slopes. The earth banks and lines are already collecting soil, leaves, and seeds and local tree species are regenerating spontaneously. Perhaps the simplest and most spectacular regeneration technique on crusted areas is a mulch of twigs and small branches of the kind that would be left over after extraction of saleable branches for firewood. The brushwood accumulates soil, sand, organic materials, and seeds, but also lowers soil temperature, protects against raindrop impact, and attracts termites, which aerate the soil. In the first year, 1983, when control plots of untreated crusted land produced no vegetation, the mulched plots yielded 440 kilograms. But in 1984—a drought year—(nearby) plowed plots had recrusted and produced only 30 kilograms of vegetation; the twig-mulched plots yielded five times as much.

The success of Guesselbodi and similar initiatives ultimately will depend on the willingness of the local people to support them. Initial economic evaluations seemed encouraging (15). Early field results, however, showed problems. Some modifications resulting from farmer participation, and support from national authorities (primarily the granting of tax exemptions for forest products) seem to have resolved the major problems and the project is now showing promising results. Some 5,000 hectares of formerly degraded land have been reforested and are providing income and other services to villages and individuals, primarily through wood products and grasses. Although wood was initially envisioned by planners as the principal benefit, access to fodder has emerged as an equally important product as identified by local participants. Thus, the lessons of Guesselbodi also illustrate the importance of long-term support, local participation, and flexibility in project development (25).

well as markets for outputs) should be available to support innovations at the outset, but should also be able to evolve to meet continued needs as development occurs. Further, the ability of the natural resource base to support a particular activity should be evaluated using a long-term view, using the basic tenet of keeping renewable resources renewable (7,18,20).

In effect, the concept of sustainability must also be viewed in dynamic terms, given the changing demands placed on farming systems in Africa. It must be recognized that change, in many cases rapid change, will be the norm. In these circumstances sustainable agriculture means continued modification of agricultural practices, and in most cases intensification, in order to accommodate growing demands (7). In the face of these growing demands, increased attention must also move beyond simply ensuring sustainability of existing systems, and begin to restore productivity of already degraded systems (box 4-1).

### Diversity and Flexibility in the Face of Adversity

**Concept 2: Africa's heterogeneous mixture of resource-poor farmers, herders, and fishers have responded to a high degree of environmental uncertainty and economic vulnerability with diverse and flexible strategies. Often these strategies minimize risk while seeking optimum stable yields, commonly at the expense of maximizing yield. Thus, development assistance should be designed to:**

- **Accommodate the diverse and flexible approaches typical of resource-poor agriculturalists. This would include enhancing their ability to manage risk, retaining their flexible household organizations, encouraging diversification of income-generating activities, and supporting indigenous experimentation and innovation in agricultural systems.**
- **Design; implement; monitor; and evaluate policies, economic strategies, and technologies for their differing effects on people of different ages, gender, ethnicity, and eco-**

**nomie status since all practice low-resource agriculture.**

- **Have available a variety of interventions (policies, programs, projects, and institutions) so that the ones most appropriate to the varied and changing needs of resource-poor agriculturalists can be met. Long-term monitoring and feedback should be used to adjust development activities so they remain useful and relevant as people's needs and conditions change.**

**poverty** and a heavy dependence on local resources, including household labor, give rise to certain common strategies among African farmers and herders. Among these strategies are planting numerous crop species, as well as multiple varieties of a particular crop. In the Congo basin, for example, it is not unusual to find as many as 30 or more different crops on a single farm (6; box 4-2). Equivalent strategies within pastoralist systems include mobility, maintaining large and diverse herds, and establishing social arrangements to gain access to increased resources during bad times (9). Chapter 3 outlines rationales for these various responses, but basically they represent strategies to:

- promote diversity of diet and income;
- stabilize production;
- minimize risk;
- reduce insect and disease incidence;
- use labor efficiently;
- intensify production within the constraints of scarce resources; and
- maximize returns under low levels of technology (2,14).

Heavy reliance on family labor sometimes creates surplus labor during parts of the year and labor shortages during other parts. African farmers accordingly have developed various practices that help moderate fluctuations in labor demands by, for example, cropping practices and sequences that spread labor demand, or reserving most nonagricultural activities for slack seasons.

The high degree of household and community self-reliance inherent in low-resource agri-

### Box 4-2.—Diversity in the African Home Garden

The home garden (also known as a compound farm) represents one important means by which farmers have diversified the form of agricultural production and the types of commodities produced. Occurring wherever cultivation is possible, home gardens are cultivated across the agro-ecological zones of Africa though they differ considerably in size, shape, intensity of cultivation, and in type and number of species grown (30). Unlike the U.S. conception of a garden as a source primarily of vegetables, African gardens also include staples (e.g., maize, yams, cassava, and legumes), tree crops, oil crops, spices, and condiments. They may also provide a variety of non-food products, including animal browse, fuel, fiber, medicine, and ornamental (30). They are important for direct household consumption and provision of cash income,

Home gardens are managed differently from other fields. They are commonly located on land closest to the homes of the farm families. Unlike the outlying fields which are extensively cultivated, home gardens are intensively farmed often on a permanent basis or with extremely short fallows. This intensive permanent cultivation is made possible by the application of animal manure, crop residues, and household refuse which help maintain soil fertility.

Home gardens also differ from other fields in the number of different crops grown, often in a multistoried structure. The number of stories and species decreases as one moves from humid to less humid areas. For example, gardens in the humid zone of Nigeria may have four stories of growth and up to 84 species of plants. The lowest story has such crops as sweet potato and melon growing along the ground. The next layer includes vegetables such as tomatoes and eggplant along with grain legumes and the seedlings of trees and shrubs. Cereals, such as maize, and small trees and shrubs make up the third layer and include citrus fruits, yams on stakes, and cassava. The topmost layer includes tall trees such as African breadfruit, oil palm, and wild figs. Besides these better known crops, a host of plants less well-known and less researched is grown,

Several benefits derive from the diversity of the home garden. Nutritionally, products of the garden provide essential nutrients that complement the crops and vegetables grown in outlying fields. In some cases, no other source for these nutrients exists. In addition, the garden supports production throughout as much of the year as possible thereby minimizing seasonal periods of food shortage. Agronomically, the multistoried and intercropped structure of the garden creates favorable micro-climates for production, and plants are arranged accordingly. Solar energy is used at the various levels, weeds are crowded out, the impacts of pests and diseases are reduced, and the roots of the different crops reach different depths and take better advantage of soil moisture and fertility. Labor productivity on established gardens is high and is well distributed over the year. The garden is also used as an experimental area where new species and varieties may be tried (5,19,30).

Home gardens have received little study concerning their agronomic functioning and actual importance to nutrition and household economy (including the roles of men's and women's labor). Improved understanding of both of these areas could support improvements in gardening. Identified areas of possible improvement include: breeding varieties which fit into garden structures, identification and extension of underutilized useful species, improved management techniques, integration of animals, improved food processing and utilization practices and access to the needed resources necessary (e.g., water and land) (5,19,30).

culture also makes flexibility, such as the ability to reallocate resources in response to changing and unanticipated circumstances, an important aspect of African farming systems. Flexibility also is a function of the unpredictability and risk commonly associated with African agriculture, particularly in areas of erratic

rainfall or high pest incidence. As one researcher expresses it:

Farmers allocate their inputs under an intersecting matrix of constraints—soil moisture status, pest outbreaks, an unexpected illness, lack of ready cash, etc.—which can rapidly change . . . In the short run attention is concentrated



on the varying mix of constraints and events, which can have quite different implications depending upon the stage of crop maturity (28).

Many ways exist for development assistance to accommodate the diversity and flexibility needed in low-resource agricultural systems. For example, increased attention could be directed toward research in multiple crop farming systems (see ch. 8). It is also important to understand social structures currently operating in support of low-resource farming systems. It can be important, for example, to understand social mechanisms (within the household or community) that determine access to and control over on- or off-farm resources. It may be valuable to investigate how women's farming

associations or savings associations, for example, maybe pooling resources or reducing risks of individual investments through joint purchasing.

Helping diversify local and regional economies can increase the availability of income-generating activities (e.g., labor for hire, small trade, carpentry, crafts) while bringing stable markets for the sale of produce and the purchase of external inputs such as tools or fertilizer. Promoting indigenous experimentation and innovation with diversified production systems should be encouraged because it brings about adaptations to existing conditions and can serve as a basis for improvements in agronomic practices, seeds, or other features (11).



*Photo credit: F. Botts/U.N. Food and Agriculture Organization*

Women in Burundi diversified their activities by raising chickens cooperatively. The Burundi Department of Rural Development received support from the U.N. Food and Agriculture Organization to train farmers.

Development assistance must be aware of the existing division of labor common in Africa (i.e., by age or sex). Responsibilities for various tasks are allocated among household members to help balance labor demands in ways that reduce labor bottlenecks. Introducing technologies can disrupt the balance and undermine anticipated improvements. For example, introducing tractors to facilitate or increase land clearing (often men's work) creates increased, even excessive, demands for weeding the field (primarily women's activity). It should also be recognized that some mechanisms used by resource-poor households [e.g., remittances from male migrant laborers, seasonal hiring of short-term labor by female-headed households] may enhance on- and off-farm opportunities.

Institutionalized inequality of households and communities in Africa can create problems for development assistance. Agricultural extension, for instance, commonly fails to reach the largest group of farmers—women—because it is run by men and directed to men's needs. Development assistance practitioners must be sensitive to the diverse and complex cultural systems of Sub-Saharan Africa for their work to be accepted. But they should strive to remove obstacles to the equitable introduction of new technologies in order to ensure its effectiveness (11).

Development assistance must support technological change while recognizing the uniqueness and diversity of African agriculture and agriculturalists (18). Each production unit will respond differently to the introduction of new methods and ideas and development interventions will be successful only if they address the varied situations present (24). In addition, development assistance should recognize that a variety of public and private sector institutions potentially are available to serve resource-poor farmers. None of these institutions should enjoy a monopoly; none should be overlooked; each should be used where it will be most effective. In particular, development assistance should recognize that local, often small, informal institutions—not just larger or more formal institutions—are important to development activities since they are directly in touch with

and accountable to local publics. Local institutions constitute an indispensable resource that governments and donors should encourage. Development assistance agencies also should promote institutions and activities that emerge from specific local needs, not from “blueprints,” and they should help them evolve to accommodate technological, social, economic, and other changes (10).

## Untapped Resources for Development

**Concept 3: Local resources—such as local people's skills, knowledge, practices, and institutions, plus indigenous plants and animals—reflect adaptations to the diverse local conditions found in Sub-Saharan Africa. Thus, development assistance should be designed to:**

- **Make local participation an integral part of the initiation, design, implementation, monitoring, and evaluation of development assistance projects.**
- **Ensure that African women, who in the past have not received the share of development assistance that their role in agriculture warrants, become full participants in the development process.**
- **Make increased use of local organizations, including assistance to improve existing organizations.**
- **Build on local resources, such as indigenous plants and animals and people's knowledge of how to use them. These resources have been largely untapped by development assistance agencies and they often can be improved.**

Experts in agricultural development assistance increasingly view many traditional agricultural systems and the products they produce as valuable resources for Africa's development. In part, this change toward increased appreciation of these resources is a function of the poor track record development assistance organizations have had so far in finding alternatives. It also reflects, however, a greater effort now being directed toward understanding practices and research that shows that these practices represent efficient responses to meeting multiple objectives with often meager resources.

In investigations of African pastoralists, for example, a conclusion has emerged that:

More and more often the livestock developer has come to realize that the practices of pastoralists make sense: animal breeds well-suited to multiple goals, herd management techniques adapted to local conditions, husbandry as up-to-date as the flow of information and technology permits, land-use management carefully adjusted to long-term social and subsistence insurance (12).

Much the same argument is made for crop and mixed crop-livestock production systems. Of particular interest are the genetic resources that have emerged to fit the particular needs of African farming systems. The varieties that have evolved over the course of hundreds of years of human and natural selection are inherently well suited to local conditions and, despite what are commonly viewed as low yields, are of critical value to low-resource systems

(box 4-3). Evidence of their value is reinforced by the poor record of improving on their performance under resource-poor conditions and people's continued use of traditional cultivars in conjunction with "improved" varieties.

Local knowledge may also provide resources for agricultural development beyond those manifest in existing production systems. Evidence exists, for example, to show that populations have information on a range of production systems that may provide important sources for innovation and agricultural intensification. One researcher notes, for example, that:

African ecological research suggests a continuum from extensive to intensive cultivation, with shifting cultivators not unaware of the costs and benefits of permanent field cultivation. From time to time cultivators may adjust their position back and forth along this continuum . . . (32).

#### Box 4-3.—*Acacia albida*: An Indigenous Resource for Development

Traditional African agriculture has long used existing resources to provide sustainable benefits. For instance, the use of *Acacia albida*—a fast-growing, leguminous tree native to Africa—is one of many practices that have been used for centuries. Historically, the tree was considered so valuable that in the Zinder region of Niger, a 19th century Sultan decreed that people found cutting *Acacia* trees would be beheaded. In Senegal, highly productive agrosilvipastoral systems have continued to evolve using the multiple benefits provided by these trees.

The species has several characteristics that are valuable in agricultural systems. For instance, at the onset of the rainy season the species drops its leaves. These leaves provide a leaf litter mulch that enriches the topsoil. During this wet season, which is when sorghum and millet are produced, the defoliated canopy permits enough light to reach the ground for cereal growth and provides enough shading to reduce the effects of intense heat. During the dry season, the *Acacia*'s long taproot draws nutrients from beyond the reach of other plants and stores these in its fruits and leaves. These drop to the ground at the beginning of the next rainy season and are consumed by livestock. Because the fodder has more nutritive value per unit weight than many other fodder crops, more livestock can be supported than without the *Acacia*. In addition, the livestock manure helps enrich the soil further. Thus, crop yields are greater when an *Acacia* is in a field than when it is not (26).

Using the tree with a proper balance of crop and livestock can also considerably extend the length of cropping without loss of productivity. For example, using the *Acacia* helped maintain continuous cropping of millet in the Sudan for 15 to 20 years in areas where the norm was 3 to 5 years.

Today, the *Acacia* is being promoted by some development groups in an attempt to provide sustainable benefits to low-resource agriculturalists. Nevertheless, many Africans were well aware of the importance of the tree as a productive resource long before the Western researchers who now tout its qualities. It provides just one of many examples of indigenous resources and production systems once overlooked or denigrated, but now commonly recognized as valuable.

The implications of this are that farmers and herders tend to have a reservoir of latent knowledge of agricultural systems and local resources. This suggests that local farmers already may have done considerable “research” of their own on different forms of production. This information could provide valuable information on development options, but requires a concerted effort to tap it.

Despite the considerable wealth of knowledge and resources in low-resource agricultural systems, this alone will not be adequate for meeting Africa’s future needs. Outside resources will be essential, in particular the application of modern science to African agricultural problems. Along these lines, however, a far greater investment needs to be made in bolstering the scientific capacity within Africa itself. In this way, African scientists—better placed to understand agriculture in their own countries—may be able to draw on knowledge and technology selectively from abroad and apply it to their own settings.

Enlisting the participation of resource-poor farmers and herders is essential in defining effective approaches to assist them. Local participation can come in many forms, including one-on-one approaches, communication with community leaders, community meetings, interaction with local and multi-village organizations or their representatives, and interactions with regional-level organizations or their representatives. Efforts to engage local participation are not without additional costs to donors and participants themselves. Therefore, effective participation depends upon identifying key places where local decision-making will most improve assistance (36).

### A Complex Web of Concoctions

**Concept 4: Low-resource agriculture in Africa is based on farming systems that have interacting ecological, social, and economic components, and these farming systems are linked, in turn, to other larger systems beyond the farm. Thus, development assistance should be designed to:**

- **Account for the integrated nature of low-resource agriculture and how these inter-**

**relationships affect the success or failure of interventions.**

- **Improve the links between farms and external systems such as markets, extension systems, and transportation networks.**

The farming systems of Africa are complex and changing. Many interacting internal and external factors affect who uses the land, how it is used, with what techniques, and for what objectives.

One way to view the integrated nature of farming systems is to use a hierarchical perspective, where ecological, economic, social, and institutional factors operate and interact at different levels (22). At one level, for example, are various factors operating within fields, for example, agronomic considerations of soil quality and water availability, or social factors such as division of labor in field activities. On a broader level are activities taking place within the entire farming enterprise, including non-farming activities. Therefore, understanding how resources are used within farming systems requires looking beyond the household, given the importance of links among households:

Investigations of numerous systems of rural production in Africa have demonstrated that viable production by individual farm households depends on their being embedded in supra-household networks. These supra-household linkages may take the form of mutual aid or have the character of patron-client relations. Whatever the form, it is clear that access to key resources or to basic factors of production lies outside the household as often as it lies within it . . . (31).

It is also important to consider agricultural development using a broader ecological framework that incorporates, for example, the environmental services (reducing run-off, controlling wind erosion, etc.) provided by natural areas beyond the farm. Disturbing these systems, as reflected in such processes as desertification and deforestation, increasingly undermines the viability of development in Africa. But protecting these resources depends on the area (e.g., the consequence of decisions made by many individual farmers given land tenure patterns) and beyond (e.g., the commitment of

national government to resource planning and management).

At the national or regional level a variety of macroeconomic and national policy issues, although seemingly removed from the day-to-day operations of resource-poor farmers, can have major impacts. How a government structures its agricultural policies (e.g., pricing, credit, and extension) and such factors as monetary or fiscal policies can significantly influence the low-resource farmer. Even international factors, such as international commodity prices and international commodity agreements, can influence agricultural activities. For example, establishing access to international markets for particular cash crops can result in fundamental restructuring in local farming systems (box 4-4)

Enhancing the links between on-farm and external systems (e.g., markets, rural financial institutions, transportation networks, research

and extension systems, and off-farm income) will require the use of different institutions and combinations of institutions. Development assistance agencies should support a wide range of institutions—public and private, governmental and nongovernmental, local and regional—depending on their comparative advantages for specific activities. Their choice should serve rural publics and help people reduce their vulnerability to external influences such as unstable markets and inadequate extension systems.

The ways in which interventions will change the relative weight of available production factors, and modes of access to those factors, require careful tracing, including both prior tracing of likely effects, based on available knowledge of linkages, and post hoc tracing, as part of the monitoring, evaluative, and directed feed-back processes of research (31).

Development assistance agencies can encourage these many layers of institutions to share

#### **Box 4-4.—Changing Farming Systems of the Nyiha of Tanzania**

Farming systems of the Nyiha people of Tanzania serve as an example of the complexity of low-resource agricultural systems and their changing links to external and internal factors. The rainy season usually lasts for 5 to 6 months in the Mbozi area, with annual precipitation averaging 40 to 50 inches (1,000 to 1,250 mm). This environment is suitable to produce the Nyiha's major staples—maize, millet, sorghum, legumes, and cassava—using a variety of traditional shifting cultivation techniques. These typically include several crop sequences followed by a fallow period.

Internal and external factors—e.g., increasing population pressure, the introduction of European-style coffee estates, and increased coffee production by resource-poor farmers—have caused major changes in local farming systems and their links with the export crop economy. As the area's population grew and as coffee production expanded, less land was available for food production. Some farmers migrated to less densely populated regions within the Mbozi area. Others intensified their food production systems, and still others incorporated coffee into their own annual labor cycle and household economy. The people who migrated continued traditional shifting cultivation. Those who intensified their food production began to replace shifting cultivation with various grassland-fallow management techniques, such as ridging, mounding, intercropping, legume/grain rotations, and production of cassava on marginal lands. Those who incorporated coffee into their household production systems mobilized male labor which was not typically involved in food production.

Each of these three groups requires a different form of development assistance. Shifting cultivators will need assistance in the transition to permanent agriculture as this becomes necessary in response to growing populations. Those that have already begun this transition can be assisted with technologies that promote sustainable production systems using their particular mix of resource endowments. Farmers growing some coffee might be assisted through efforts to adapt scaled-down techniques from larger coffee plantations. They use more inputs such as fertilizers and modern management techniques, and are able to rely on external institutional arrangements and marketing systems to obtain their inputs. On these farms, traditional food production meets most subsistence needs and provides some income, while coffee production provides additional income from exports (18).

information and coordinate their efforts. Development assistance agencies also can work with national governments to reform bureaucratic structures and procedures as necessary so they serve low-resource farmers more effectively (10). In addition, special attention should

be given to encourage maintenance of diverse social connections between households, groups, other cooperative groups, and communities because these networks help reduce risk and serve the varied needs of low-resource agriculturalists.

## A RESOURCE-ENHANCING APPROACH: A COMPARATIVE ASSESSMENT

A variety of approaches to development assistance exist and donors often use mutually supportive elements from several. A resource-enhancing approach would have elements in common with other strategies addressing agricultural development and some significant differences. To illustrate these similarities and differences, three donor approaches are compared and contrasted with a resource-enhancing approach. The three approaches are:

- The New Directions/basic human needs approach which sought to provide such basic human needs as food, education, and health care for the poor.
- The Accelerated Development/policy reform approach which has come to focus on reforming national policies that constrain economic development, including development of the agricultural sector.
- An approach promoting accelerated growth in food production, primarily in the highest potential regions, detailed by the International Food Policy Research Institute (IFPRI),<sup>3</sup> through increases in use of commercial inputs, infrastructure, and African institutional capabilities.

A resource-enhancing approach shares a common overall emphasis with these three strategies. All seek to develop agriculture as the primary means to support national development. Within agriculture, all four focus on the

“small farmer” and not larger, commercial, or state run farms. The four strategies differ significantly, however, on how best to support the development of this group, and on what portion of this broad group should be addressed.

The United States’ development strategy was redirected toward improving the lives of the poor by the 1973 New Directions legislation amending the Foreign Assistance Act of 1961. This change stemmed from criticisms that previous U.S. aid to developing countries was supporting inequitable economic growth and that it was not helping the poor who made up a significant and growing percentage of recipients (21). With this approach, the purpose of development assistance shifted to increasing the poor’s access to food, health care, and education. The poor were to benefit through the direct provision of these basic human needs and by increased access to factors such as credit, extension, and improved infrastructure that could increase their productivity and income. Increases in income would then enable the poor to supply their own needs. Assistance was also intended to increase the poor’s participation in and control over development. Because the majority of Africa’s poor are agriculturalists, agriculture became a central focus of the strategy although attention was also given to the urban poor. Project aid was an important means of providing for basic human needs (16).

The impact of the New Directions strategy was limited both by conditions in Africa and by its actual implementation. These problems included:

- a lack of trained Africans to program development assistance funds and to run the projects;

<sup>3</sup>Researchers associated with the International Food Policy Research Institute (IFPRI), 1 of 13 centers of the Consultative Group on International Agricultural Research, have recently detailed this approach in J. Mellor, C. Delgado, and M. Blackie (eds.), *Accelerating Food Production in Sub-Saharan Africa* (Baltimore, MD: The Johns Hopkins University Press, 1987). For this section, this approach is called “the IFPRI approach.”

- a lack of improved agricultural technology to be transferred to poor farmers, inhibiting the potential for increases in agricultural production and income and thereby leading to a greater emphasis on the direct provision of basic human needs;
- a lack of indigenous institutions and trained personnel capable of generating agricultural technology and supporting the development of agriculture;
- the existence of national policies which discouraged increased agricultural production;
- projects' failure to generate the revenues needed to be self-sustaining;
- overly complex attempts to deliver different services and goods, combined with the unfilled need to coordinate differing bureaucracies;
- projects' failure to address local environmental and social conditions; and
- projects' failure to ensure beneficiaries' participation (16,21).

These constraints became evident as projects were implemented to carry out the New Directions strategy. Their identification was a key reason for the design of the other three approaches, which have responded to these shortcomings in different ways, and for modifying the New Directions approach itself.

Lack of national economic growth in Africa and the identification of the important role of national policy in this problem led to the more macro-economic approach of Accelerated Development, first detailed in a 1981 World Bank report, *Accelerated Development in Sub-Saharan Africa: An Agenda for Action*, prepared at the request of the African Governors of the World Bank. According to the Accelerated Development approach, changes in national policies (known as policy reforms) are key to national economic growth and three types of policies are of primary importance: suitable trade and exchange-rates; increased efficiency of the public sector; and supportive agricultural policies. Agriculture is seen as the most important determinant of economic growth. Means to support agriculture would include: a focus on smallholders with greatest attention paid to the highest potential regions,

increased prices for agricultural products, more competitive markets, increased rural availability of consumer goods, improved transport and marketing infrastructure, increased research, and increased attention to export crops where a comparative advantage exists (38). Over time, donors have come to focus primarily on the policy reform aspects of Accelerated Development, giving less attention to those nonpolicy factors also identified in the approach; hence, the increased use of the term Policy Reform as a donor approach. Donors have also focused more on changing actual policies than building African support and capability to do so. They have concentrated on supporting a set of reforms which address such current policies as:

- below-market prices paid to farmers for their commodities, set by the government as a way to increase government revenue (especially from export crops) and to provide cheap food to politically important urban populations;
- overvalued exchange rates combined with import restrictions used to conserve foreign exchange, make food imports cheaper, and make food exports less remunerative for the farmer, imported agricultural technology more expensive, and consumer goods more expensive;
- a failure by the government to invest adequately in agricultural development; and
- an overreliance on parastatals for marketing agricultural inputs and outputs, which has led to inefficient marketing, high marketing and transport costs, and locking out the indigenous private sector (21,34,38).

In addition to the benefits incurred by changing such policies, Policy Reform is attractive because of how it can be implemented. Donors can move large amounts of assistance quickly in return for promises of policy change and thus meet their own budget timetables and react to domestic political needs. Measurable goals can be set, such as changes in exchange rates or prices, and can be reached relatively quickly thus meeting demands for documentable, fast results. In addition, expatriate personnel requirements are seen as lower than those necessary for New Directions' type project assis-

tance and macro-level data analysis can occur at central locations. These justifications have been challenged, however, because some see reform as a slow process and note that personnel requirements are not reduced only shifted (3,4).

Policy Reform's approach and its implementation have raised several concerns over its impact. Its emphasis on national-level economic growth and, for agriculture, national production increases may overlook the goal of equitable growth and an emphasis on the poor majority. This concern is partly based on a lack of data conclusively showing links between policy reforms and increases in production and income among resource-poor agriculturalists. It is also a function of growing evidence of negative impacts that structural adjustment policies can have on the poorer segments of society. Assumptions that policy reforms can be effective in bolstering production without, among other things, addressing technical or infrastructural bottlenecks are also being challenged. In sum, questions are increasingly being raised regarding the wisdom of pursuing macro-level reforms on a broad scale without adequately understanding their impact at the micro-level (see ch. 6).

Another criticism of current implementation of Policy Reform is that it is not creating African capacity to implement and maintain such reform. This lack of attention to African capability contradicts the original conception of the Accelerated Development approach, with its stress on donor support for such activities (38).

The failure of the New Directions and Policy Reform approaches to address the technical and institutional needs of African agricultural development led to an approach to accelerate food production growth, detailed by the International Food Policy Research Institute (IFPRI). The IFPRI approach is based on the theory that increases in food production will lead to increases in farmer income which will in turn lead to increases in production and employment in other sectors of the economy.

Improved technology is seen as the driving force for speeding growth in food production.

And national economic growth will depend on the commercialization of smallholder production, needed for the adoption of improved technology. According to this strategy, resources should be directed to: 1) fertilizer distribution, 2] agricultural research, 3) education and training, and 4) infrastructure development. Policy reform is an important but not primary goal and reforms emphasized are those that address these four areas.

The IFPRI strategy seeks to build African capability necessary to carry out development as it supports the implementation of these four factors. For example, indigenous fertilizer distribution systems and African analytical ability to set regional fertilizer priorities and import/distribution policies would be improved along with increases in the distribution of fertilizer. To support agricultural research, the approach emphasizes building and improving African research institutions. Increasing and improving human resources is part of building these African research institutions as staff must be trained to use and manage them. In addition, formal education for farmers would be increased so farmers could avail themselves of the services of agricultural institutions. Finally, improved rural infrastructure would benefit African transport and marketing capability and would require the involvement of local governments and rural organizations because of construction costs and maintenance needs.

The IFPRI strategy argues that donor assistance should be aimed at better-off areas that can take most advantage of the scarce development resources available. This means focusing on higher income small farmers who can invest in new technology and on geographic areas with favorable rainfall and soils or where soil problems can be solved. For commodities, this means limiting the majority of internationally supported research to a small set of widely grown, staple crops, such as maize, rice, sorghum, and cassava, that have the possibility for major improvement, especially in the higher potential geographic areas.

For many, the IFPRI approach, like Policy Reform, raises concerns over equity. Focusing



assistance on the better endowed regions will bypass large numbers of Africans and contribute to increasing inequalities in income. Bypassing large numbers of persons also reduces the positive impact better-off agriculturalists have on stimulating economic growth since fewer people will be in this group (8). In addition, ignoring the less well-off regions will lead to ignoring the unsustainable production now taking place there and degradation of the natural resource base will continue.

These three approaches have been developed to address constraints to agricultural development: New Directions with lack of equity; Policy Reform with unsupportive national policies for agriculture; and IFPRI with a lack of technology and institutional support. A resource-enhancing approach combines parts of each of these three strategies to address the needs and abilities of resource-poor agriculturalists. For this reason, a resource-enhancing approach overlaps with each on specific points but also has significant differences.

A resource-enhancing approach shares New Directions' emphasis on equity because both address development of the majority of the poor although New Directions is broader because it also addresses the urban poor. Also, a resource-enhancing approach concentrates on increasing the productivity of the poor, versus New Directions' provision of basic needs—giving the former a more technical and institutional orientation. Provision of basic education, health care, and food, while complementary to a resource-enhancing approach, is peripheral to it.

Policy Reform's identification of the importance of supportive national policies is built into this resource-enhancing approach. Technologies and institutions' effectiveness can be greatly reduced by discriminatory policies. Unlike Policy Reform, though, a resource-enhancing approach would link reforms in policies primarily to the development of resource-poor agriculturalists. Therefore, action on such reforms would stress: links to the on-the-ground working of the agricultural sector, ensuring that benefits are received by a majority of resource-

poor agriculturalists; providing "safety nets" for the poor significantly hurt by reforms; and providing significant attention to building African capacity to create and implement such reforms in order to ensure the two above points and the sustainability of the reforms. Policy reforms remain important in a resource-enhancing approach but less so than in a Policy Reform approach as resources must be used to support technical and institutional needs as well.

A resource-enhancing approach incorporates many of the components of the IFPRI approach. Both place strong emphasis on the need for improved technology, and both include the need for ensuring that technologies address the real constraints faced by farmers and herders through means such as on-farm testing of technology and farming systems research. In addition, both emphasize the need for institutional development to develop and support improved technology. This leads to a common emphasis on building African capability to carry out this work.

However, significant differences exist between the two approaches. A resource-enhancing approach would not direct assistance to only those agriculturalists and areas with high potential for improvement. It would address wider populations and geographic areas for reasons of equity and to prevent a large majority of resource-poor agriculturalists from being bypassed by development. This leads to different technological choices because the appropriateness of a technology depends, in part, on the resources available to an agriculturalist. For example, a resource-enhancing strategy would support the use of commercial fertilizers where applicable. However, it would not give them the same overall emphasis as the IFPRI strategy because significantly expanded use of purchased fertilizers is not affordable nor available to a large proportion of resource-poor farmers. Also, a resource-enhancing approach would support research on a broader range of agricultural commodities. Although some of these make up a comparatively small percentage of total agricultural production, they are often essential to household nutrition and in-

come, and existing technologies could be adapted to improve their production. Addressing this concern would stretch research resources; therefore, greater emphasis is placed on developing national research capability and linking researchers, extension services, and agriculturalists in the most productive way. At the same time, a resource-enhancing approach places greater emphasis on slowing degradation of the natural resource base, much of which is occurring outside higher potential areas.

A resource-enhancing approach is apt to support small, evolutionary gains in production, placing greater emphasis on using available resources (e. g., technologies and local organiza-

tions). Where favorable factors of production (e.g., climate, soil, markets, research capabilities) exist, the IFPRI approach may be more relevant for local agricultural development. Although both approaches stress the formal training and development of institutions necessary for agricultural development, a resource-enhancing approach gives greater emphasis to linking this training and institution-building to the needs of low-resource agriculture. Resource-poor farmers and herders themselves play a larger role in a resource-enhancing approach via contributing knowledge, taking part in research, and working through their own organizations.

## AFRICAN PERSPECTIVES

OTA solicited the thoughts of individual African colleagues concerning the relevance of its work on low-resource agriculture to African agricultural development.<sup>4</sup> The overall response was that OTA's approach to enhancing low-resource agriculture fit within their own conceptions of African agricultural development and this approach would be a realistic one for solving African food deficits. Several points were stressed:

First, the importance of the diversity of African agriculture was reiterated. All of the countries have problems but some face an agricultural crisis. The causes of these problems vary from country to country; and solutions also will vary. For this reason, development assistance needs to be flexible so that it can address local problems and develop an appropriate mix of responses. Promoting a single technique, such as adjusting pricing policies, with equal vigor across the continent was seen as a mistake. In

order to have the necessary flexibility, donors would need to increase the decision making authority of their in-country personnel.

Second, increasing African capability was seen as essential. This could be carried out by increasing support for education and training, institutional support including core funding especially for research, and support for local organizations. In addition, donors should reduce their dependence on expatriates; increase their use of Africans; and give Africans more control and participation in project and program design, management, and evaluation.

Third, a need exists to work with the resources and technology available to the majority of the agriculturalists. Making use of traditional knowledge will be part of this work and technologies and institutions that can support traditional systems of farming are necessary. Farmers' knowledge and participation should be incorporated into the work and women should be actively involved. Technologies will need to support sustainable productivity.

Fourth, the nature of this approach means that assistance must be long term and have development as its goal. Levels and types of assistance should not be decided along political lines.

<sup>4</sup>OTA surveyed some 40 African researchers and policymakers (app. C) for their views on: the state of agriculture in their region, how their views differ from those of donor agency personnel, how appropriate is OTA's model of low-resource agriculture, and what would be a constructive U.S. foreign assistance program for Africa. Their views were synthesized in: Hussein Adam, "African Perspectives of Low-Resource Agriculture," contractor report prepared for the Office of Technology Assessment (Springfield, VA: National Technical Information Service, December 1987).



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Photo credit: F. Mattioli, U.N. Food and Agriculture Organization



Photo credit: F. Botts, U.N. Food and Agriculture Organization

Africans stressed the need for U.S. development assistance to match Africa's diversity, to ensure that Africans' capabilities are increased, to build on the resources that the majority of agriculturalists have available to them, and to be committed to a long-term effort with development its most important goal.

Included with their general agreement with the approach of enhancing low-resource agriculture were several caveats. There was concern that any approach not become the sole strategy for agricultural development. Instead it should be carried out in conjunction with other approaches, such as increasing non-farm employment and improving rural people's health and education. The approach should not become subsistence-oriented but aim toward increasing the practice of science-based agriculture. Also, when carrying out the approach it should be remembered that some traditional practices will restrain agricultural development and should be discarded.

A small minority of responses strongly disagreed with an approach to enhance low-resource agriculture. Fears were expressed that it would lead to a class of farmers trapped at the subsistence level. In some cases, traditional systems were seen as impediments to develop-

ment. And concern existed that the United States was incapable of carrying out a resource-enhancing approach because of U.S. emphasis on topdown approaches and providing food aid.

An additional issue raised by the respondents was the need to address corruption and the misuse of assistance. Where corruption is prevalent, the need to ensure the use of funds for development purposes should override the need for African management of funding and donor agencies should retain spending control.

Throughout the responses ran the call to consult with Africans before carrying out development assistance. This was expressed directly in respondents' specific comments and indirectly in the tone of their letters. Many expressed surprise and pleasure that the United States Congress had sought their opinions.

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