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AFRICA BUREAU AGRICULTURAL RESEARCH STRATEGY PAPER

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I. INTRODUCTION

A. Purpose and Scope of the Strategy

Agricultural production in Sub-Saharan Africa has lagged behind all other regions in the world over the past two decades. Per capita food production has declined as a result of stagnation in the agricultural sector and a high rate of urbanization. Inadequate attention to agricultural research has contributed to this stagnation.

AID's Food Sector Assistance Strategy for Sub-Saharan Africa gives priority to planning and policy analysis, increasing farmer participation in decision making and building institutions - research, extension, training - which provide appropriate technology, information and inputs for increasing productivity in agriculture. This paper provides guidelines on how AID should approach agricultural research in Sub-Saharan Africa. The objective of this agricultural research strategy is to increase Africa's ability to supply more food to its steadily increasing population at a lower cost than would be the case in the absence of the strategy. The strategy emphasizes research on all aspects of food production by small farmers who produce, or who have the potential for producing, marketable surpluses. It also includes other promising crops, agricultural enterprises and processing technologies that provide income to farmers and, as a result, stimulate effective demand for agricultural production inputs. Implementing this research strategy is expected to generate a continuous flow of new technologies which will find wide acceptance among the target group, and increase the productivity of small scale farms. As a result, farm production and incomes should increase and levels of living in rural areas should improve.

B. Main Components of the Strategy

The main components of the strategy are:

- making a long term commitment to strengthening national agricultural research institutions by providing capital and operating cost support, as well as training and technical assistance;

- approaching technical agricultural research on the basis of ecological zones rather than individual countries;

  supporting regional cooperation and coordination among countries within broad ecological zones, including establishment of African mechanisms for effecting regional cooperation and strengthening regional networks of research scientists to attack common problems;

- reorienting adaptive research to focus on crops and livestock within the farm as a production/consumption unit by supporting a farming systems approach to research and stronger links between research, extension and the farmer;

- establishing closer links between higher education and research;
- supporting initiatives to supply inputs, establish markets and provide services to the agricultural sector, using the private sector as much as possible.

II. DESCRIPTION AND DIAGNOSIS OF THE RESEARCH ENVIRONMENT

A. Research Institutions

Agriculture research in Africa is carried out by national research systems and five International Agricultural Research Centers (IARC's): International Institute of Tropical Agriculture (IITA), International Livestock Center for Africa (ILCA), International Laboratory for Research on Animal Diseases (ILRAD), West African Rice Development Association (WARDA), International Center for Insect Physiology and Ecology (ICIPE) and a substation of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). In addition, the Institute of Tropical Agronomic Research (IRAT), the International Maize and Wheat Improvement Center (CIMMYT), and numerous international donors provide and support researchers attached to national research institutions throughout Sub-Saharan Africa. Other externally based institutions support social science research by providing scholars and financing to national institutions or African universities.

Over the past two decades the IARC's have increasingly served the function of providing improved plant materials to national programs. National programs and country stations, in turn, utilize IARC materials to concentrate more on adaptive research and cultural practices. In theory, at least, they then select those improved varieties and technical packages which will be acceptable to farmers. For this reason, effective national agricultural research institutions in African countries are essential.

B. Problems With Agricultural Research in Sub-Saharan Africa

National agricultural research institutions and programs in Sub-Saharan Africa vary in both size and effectiveness. In general, however, they are weak, poorly staffed, equipped, financed and managed. Linkages and interchanges among national systems and with international centers are few though improving.

Most agricultural research programs are structured along commodity and/or disciplinary lines. Until recently, research was oriented toward export crops and animal health, with food crops and animal husbandry largely neglected. The research programs concentrated on the physio-biological

aspects of crop and livestock production with limited attention to socio-economic aspects. Most of the research has been -- and, to a large degree, continues to be -- done in laboratories and on experiment stations with few direct linkages with, or participation by, extension service personnel or the farmer. Links between research and higher education are equally weak. These orientations are beginning to change, but much more needs to be done to sharpen the focus and bring about greater integration of efforts.

With few exceptions, technologies involving the use of improved varieties, pest management, cultural and fertilization practices for increasing production and productivity of the principal food crops have found little application by the African farmer. This is only partly due to the somewhat overstated, but mostly valid, assertion that the technologies developed by researchers have not been adapted to the conditions of the African farmer. In part, it results from a failure of researchers to recognize critical production constraints as viewed by the farmer. It also arises from weak extension services which do not effectively present the improved technologies to farmers. Frequently, the production inputs necessary to adopt a new technology are not available in rural areas, or are available at inappropriate times. Finally, the policy and institutional context often discourage the adoption or sustainability of what appear to be technically sound innovations. These latter include unfavorable pricing policies and weak effective demand for increased production. In practice, all of these factors contribute to the lack of payoff from crop research expenditures.

In the livestock subsector, research has focused on disease control. Although generally acceptable to African livestock producers, the findings are frequently not applied because of weak institutional capability to render the required services. There has also been a good deal of research relating to livestock husbandry and the use of animal power, but adoption rates have been hampered by lack of extension and veterinary support, markets and economic incentives.

C. Complexity of African Farming Systems

The farming systems typical of small commercial farms in Africa constitute a difficult environment for agricultural research. Most farms are seldom over one hectare per active agricultural worker, and use no modern inputs. Production is more extensive than intensive. Soils are infertile and, as a result, average yields are quite low. The majority of farms interplant several crops on the same field during the same season in order to maximize the return to their labor, minimize risk associated with specialization in the face of an uncertain physical environment, facilitate weed and other pest control; and prevent soil erosion. Non-food crops are frequently an important component of the farming system but, in general, are aggressively pursued only when family food supplies are assured or cash needs are particularly acute. Food and non-food crop interactions can be

quite complex as farmers alter planting dates and cultural practices in order to overcome seasonal labor constraints, or hedge against rainfall uncertainties. Most farmers still practice shifting cultivation as a low-energy system of soil fertility management. Overall, minimizing risk appears to be a very important objective for the majority of African farmers.

Many African farmers have at least some livestock. Animals help spread risk and, under rural living conditions, generally serve as a much more effective store of wealth than money. In mixed farming areas, livestock/crop interactions are usually important, while in pastoral areas, social relationships are built around livestock. In both cases, researchers need to evaluate their work in a broader context than is the case in developed countries.

D. Interdependence of the Policy/Institutional Framework and Research Agendas

Given the complexity of farming systems in rural Africa, it is clear that increasing agricultural productivity will require technology which is adaptable to the total environment, including the socio-economic milieu, within which the farmer lives and works. In this context, the policy and institutional framework has a powerful influence on what constitutes relevant research in a given country. For example, low prices for food crops, coupled with the poor record of research and input supply in Africa over the past two decades, has recently given rise in AID to an emphasis on developing low-technology or low-energy innovations for increasing agricultural production and productivity, essentially minimizing the need for farmers to purchase inputs. While this approach may have had merit in the policy/ institutional environment that existed over much of the last decade, AID's food sector assistance strategy is directed toward creating a more favorable environment for agricultural production in the future. To the extent donor agencies and national governments succeed in developing agricultural input and servicing institutions, higher energy technologies more dependent on the use of fertilizer, hybrid seed and other purchased inputs will offer a more attractive focus for research programs in Africa than in the past.

From a technical point of view, there is little doubt that, in the short run, technologies which rely more heavily on purchased inputs offer greater potential for increasing agricultural productivity and marketable surplus than do technologies requiring fewer cash inputs. For this reason AID should continue to encourage the evolution of stable policies and institutions which are favorable to agricultural development, particularly those relating to markets and prices for food crops and the availability of agricultural inputs. At the same time, the importance that African farmers place on minimizing risk, coupled with the high cost of energy and the uncertain efficacy and sustainability of new policies and institutions, suggest that research on cropping systems which increase agricultural productivity with minimal use of purchased inputs, should continue.

E. Limited National Agricultural Research Capabilities

In most countries, agricultural research has historically been neglected. Salaries for researchers are low, research institutions are weak and research programs, largely dependent on external financing, lack continuity. Apart from paying salaries, few African governments provide adequate operating cost support even for high priority national research and extension programs. Highly trained local and expatriate personnel are frequently underutilized as a result. Sometimes, promising research activities are abandoned for similar reasons. Managerial discipline with respect to those resources which are available, has also been a problem.

In some African countries the area in production of specific crops and livestock is so small that it is difficult to justify, on economic grounds, major expenditures on basic agricultural research directed toward national needs alone. In order to realize justifiable returns on investments in agricultural research, such countries will need to integrate their basic and some of their applied agricultural research programs with those of neighboring countries with similar agricultural production patterns. Joint planning of research reduces duplication and circulation of research findings contributes to more rapid solution of problems; both goals can be reached through regional networking of scientists and related coordinating activities. Regional programs can provide basic and applied research on selected parts of common problems. Thus, regional programs can supplement and complement national research. Yet, even with greater cooperation, low per capita incomes relative to public sector revenue needs, coupled with the relatively long gestation periods between investment in research and increases in production, make financing the operating costs of a serious broad based agricultural research program difficult for most African governments.

F. Implications for a Research Strategy

The limited capabilities of existing national research systems, the large number of countries involved and the limited resources available to develop and support national systems dictate that strengthening efforts be done judiciously. The similarities of many problems affecting groups of countries within given agro-climatic zones suggest that national programs can derive substantially greater benefit from available resources if there is more regional focus of basic research activities, greater regional cooperation among countries and greater coordination of assistance among donors. Regional cooperation and coordination should cover higher level agricultural education and training as well as agricultural research.

The nature and magnitude of the task of strengthening national agricultural research systems, and the time required to develop cooperative and complementary programs to produce useful production technologies, requires that external donor assistance programs be cast in a long-term framework -- 10 to 20 years. This will require a more flexible and

evolutionary approach to project design and implementation. In addition, host governments will have to address problems related to the incentive structure for agricultural research, the lack of operating funds and managerial discipline in research programs, as well as particularly weak links between research and extension before they can hope to sustain effective research programs on their own.

With respect to the content of agricultural research programs, there is a clear need for greater attention to food crops, and for placing adaptive research on cropping and livestock production systems in the broader context of the farm household as a production/consumption unit. This will require greater decentralization of national adaptive research programs in contrast to the greater regional coordination sought for basic research. At the same time, research programs must not overlook national agricultural policies, socio-economic aspects of agricultural production, agricultural marketing and food technology aimed at increasing the demand for, and the nutritional content of, local foodstuffs.

III. ELEMENTS OF THE STRATEGY

The focus of AID assistance will be on the long term strengthening of national agricultural research institutions and systems, to serve their own farmers, within an overall framework of regional cooperation among countries and among donors. Indeed, regional cooperation can be effectively developed only if there are strong national institutions in some of the countries within the region, and relatively easy movement of plant materials, research results and scientists among countries.

A. Strengthening National Agricultural Research Institutions and Programs

AID will provide long term -- 10 to 20 years -- support for strengthening national agricultural research institutions in selected countries through training, technical assistance and capital and operating cost support for targeted research activities. AID will support adaptive and policy related research which is of priority interest to the country involved, as well as basic research which is relevant to broader problems within an agro-climatic zone. Within each zone only selected countries, identified by Cooperation for Development in Africa (CDA) in consultation with African organizations will receive broad based support. In general, the countries and institutions selected for emphasis will be those with the greatest agricultural potential, and a sufficiently developed institutional capacity to enable them to undertake successful broad based research programs. Research institutions in other countries in a zone will be provided more limited assistance as may be necessary for them to effectively participate in established research networks. This might include, but not be limited to, provision of liaison or outreach crop and livestock production officers and other support for site-specific adaptive research. Training will be more broadly programmed so as to involve participants from all countries. Training should be the most important assistance provided to those countries with minimal existing research capabilities.

Developing stronger national research institutions will require attention to government and institutional policies regarding assignment and compensation of research and extension personnel and other key areas. Frequent transfers of personnel at all levels, including the promotion of good technicians to administrative positions, prevent the continuity and stability of personnel so important to effective long term research programs. It will be necessary for African governments to establish career track positions for agricultural researchers, and ensure that the compensation and perquisites they receive are commensurate with their training, skills, experience and ability to contribute, as well as with other opportunities available to them within their national economies. U.S. institutions contracting with AID for project implementation must also be prepared to commit key research personnel on a long term basis.

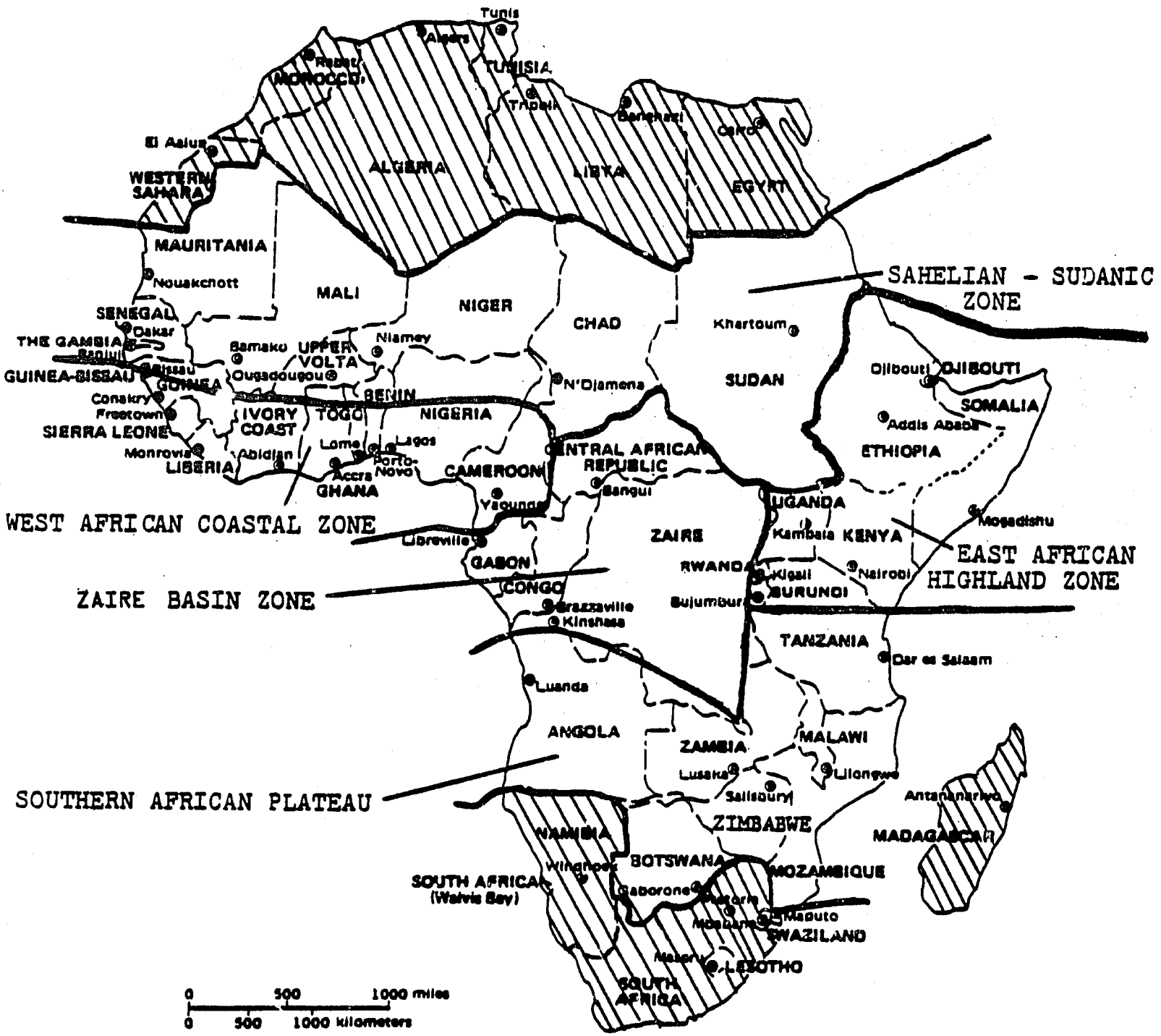
AID assistance should include operating cost as well as capital cost support for zonal and national research activities for several years. Though AID needs to find better ways of assuring that national governments provide necessary operating cost support on a timely basis, the poor record of African governments in this regard, and the importance of timeliness and continuity in field research operations, calls for a more definitive solution. Since most African governments are quite conscientious in paying salaries, AID should generally concentrate its operating cost support on non-salary items. Such support should be tied to specific research programs which are consistent with other aspects of this strategy, and to commitments from host governments which promise to establish discipline, continuity, sustainability and fiscal soundness in agricultural research programs.

B. Zonal Approach to Agricultural Research

With some 42 countries on the mainland of Sub-Saharan Africa and the enormous cost of agricultural research, it would be impractical to approach agricultural research problems entirely on a country by country basis. Therefore, AID strategy is to deal with the problems on a regional or zonal basis as much as possible -- the zones being defined in terms of ecological similarity and geographic coherence. Five zones, the same ones identified by the CDA group of donors, will be used: (a) Sahelian-Sudanic zone across the broad belt of Africa from Senegal to Sudan, (b) East African Highlands, (c) Southern Africa Plateau, (d) the Zaire Basin, and (e) the West African Coastal Zone (see map).

Research councils made up of key agricultural research scientists working in the zone, will make an inventory of what has been accomplished thus far in national and regional agricultural research programs within the zone. With this as background, the councils will identify priority problems, define the status of knowledge on these problems, and make an inventory of the national resources and facilities available to research them. This information would then become the basis for planning zonal research programs.

MAP: CDA Agro-Climatic Zones



C. Regional Cooperation and Coordination

Planning on a zonal basis, while respecting the integrity of national research programs, will require close collaboration among countries and institutions within the zone and among donors, the international agricultural research centers, universities and other institutions which are supporting research and extension in the zone. In order to promote such collaboration AID, and hopefully other donors, will encourage the creation of zonal research councils. These zonal councils will, over a considerable period of time, assume an important role in guiding major research undertakings of zonal interest, forming and supporting networks of researchers to focus on specific crops and problems.

African regional organizations such as The Southern African Development Coordination Conference (SADCC), the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) and broader groupings such as the Scientific and Technical Research Committee of the Organization of African Unity (OAU/STRC) are expected to play an important role in promoting regional cooperation. They will assist with creation of the zonal councils by sponsoring planning meetings, consultative workshops and disseminating information. Donors are expected to coordinate their support more closely through informal groups such as CDA. AID will provide support for both the regional organizations and the research councils to enable them to convene meetings for planning and evaluation, to sponsor workshops for reviewing timely research topics, to exchange research information and to provide international travel for participating scientists.

The purpose of the councils and zonal research networks will be to reduce duplication and exploit complementarities in research programs within the zones as much as possible. As a consequence, each national agricultural research system should benefit through more effective use of its individual resources in reaching national program objectives. In many instances the councils will synergetically bring to bear the amount of intellectual capital, critical mass or additional resources needed to resolve specific research problems.

Organizing the councils to accomplish the above tasks will necessarily be a long-term effort, perhaps commencing with informal meetings and building upon existing linkages between senior scientists within an agro-climatic zone. AID will strengthen the councils through bilateral and regional research projects which support regional cooperation and the broad objectives of the zonal research programs.

D. Farming Systems Orientation

The strategy will encourage and reinforce the emerging reorientation of adaptive research programs to address more directly the problems of the small African farmer. This means setting research priorities and seeking technical solutions to food crop and livestock productivity problems in the context of the whole farm/living system, as well as external factors which determine incentives. Failure to do this partially explains the poor record of agricultural research in the past.

A farming systems approach to research, by definition, forges close links between research, extension and the farmer. All three become active members of a collaborative research team seeking to articulate critical agricultural production constraints facing farmers, and identify feasible technical solutions to them. The farming systems approach views crop and livestock production as integral components of a complex production/consumption system. This approach does not exclude commodity research or research on components of the system. It does, however, emphasize the need to recognize connections with other components and, in collaboration with farmers, to plan research and evaluate results while taking such linkages specifically into account. The farming systems approach, therefore, must include food, non-food and livestock enterprises of the farming system in its research program as well as related factors making up the socio-economic context. This in no way impedes or negates a relative emphasis on food crops. It does, however, require a more substantial social science input than has been customary in the past, especially with respect to farm management.

In spite of the tremendous interest in farming systems research by international donors and international research institutes, many national research institutions continue to resist a farming systems orientation in their applied work. This arises partly because institutional links between research and extension are often weak and indirect. AID should work to reduce this institutional distance through its training and research activities. In situations where it does not prove possible to bring research and extension together to work on a common set of problems, researchers should establish direct links with farmers until the extension system can assume a contributing role.

E. Closer Links Between Training and Research

The Africa Bureau agricultural research strategy seeks to strengthen linkages between research and the training of agricultural scientists. This strengthening should be accomplished both through the mechanisms and structures utilized for project implementation as well as through policy and institutional reform within host countries.

Links between research and education can be strengthened by encouraging research scientists to teach formal courses, or by providing funding so that agricultural training schools can incorporate farming systems research methods into their curriculum. Students writing monographs or theses can do these in-country, or under similar ecological conditions in an adjacent country, on topics that relate to research programs in their own country. This will enhance the relevance of both the thesis and academic training to longer-term national research programs and will fully justify the additional cost. It will also help overcome the excessive specialization that characterizes most of U.S. higher education in the agricultural sciences.

AID will encourage and support short-term training for research managers and directors, principally through organizations like the International Service for National Agricultural Research (ISNAR). AID will provide short-term training for other research workers through participation in workshops, seminars and in timely short courses on specific subjects in African institutions, in IARC's and in U.S. institutions.

Perhaps the most important element of short-term training should be on-the-job training. One of the weakest points in the research systems of most countries is the inability to provide adequate guidance to young and inexperienced research personnel. Until more host country professionals with a broad perspective become available for research, expatriate personnel will play an important role in providing this kind of training.

F. Private Sector Initiatives in Providing Inputs and Supporting Services

AID's research strategy anticipates improvement in the availability of agricultural inputs. In order to bring this about, AID will support private sector initiatives in providing agricultural inputs and supporting services, such as credit and marketing. Where private sector institutions do not exist, AID will support parastatal organizations aimed at stimulating the involvement of the private sector, provided such institutions are not given monopoly rights that effectively exclude the private sector from important components of the system.

IV. IMPLEMENTATION

A. Assuring Continuity of Effort and Successful Networking

The experience of AID over many years is that, while it is possible to obtain the services of capable expatriate personnel for the usual two year assignment in an African institution, it has been most difficult to extend such assignments for the longer periods which are necessary for the continuity so important in research. Other experience suggests that effective team work among senior expatriates and typically more junior nationals can be difficult to achieve with full time assignment of the expatriates because counterparts are not assigned or are given reduced responsibilities as long as expatriates are available.

In order to avoid these two problems the strategy emphasizes utilizing senior experienced U.S. or African scientists on a continuous advisory and consulting basis to provide guidance to junior African personnel on given research projects. This will require that the contracting institution be prepared to provide specific individuals for repeated short-term assignments over an extended period -- five to ten years. The same approach could be used to supervise and ensure the relevance of in-country thesis research by African graduate students who are pursuing degree programs in U.S. universities.

Because in most African research institutions even junior personnel are frequently in short supply, it may be necessary to add a limited number of expatriate personnel on a full time basis to round out the staff necessary for a given research program. No matter how expatriates are provided, however, U.S. institutions contracting to provide technical assistance and training services must be prepared to make a long-term commitment to research programs. This may require attention to policies which prevent tenured faculty from spending lengthy periods away from the campus.

AID will provide continuity of leadership and more effective networking by assigning regional coordination responsibilities to a contractor or a Title XII institution working in conjunction with African regional organizations such as STRC, CILSS and SADCC. Expatriate regional liaison officers and/or advisors could travel in pairs with African counterparts, drawn from national research stations but financed by AID, helping to establish practical ad hoc links wherever appropriate and laying the foundation for more formal links through the research councils. They could also help individual AID missions design bilateral projects that mesh more closely with regional projects and projects of other bilateral donors.

B. Institutional Resources

The principle reservoirs of institutionally supported agricultural research scientists available to AID for international work are the land grant universities, USDA, semi-private and private research institutions, the IARC's and selected Africa regional institutions. Some of these institutions are already committed to long-term involvement through the AID sponsored Collaborative Research Support Programs, and AID regional and national research projects. Others are most anxious to provide the kind of long-term support to national and regional agricultural research programs envisioned by this strategy. AID will contract directly with such institutions to provide technical assistance.

C. Capital and Operating Cost Support

Providing adequate facilities and equipment must be an integral part of any research undertaking. This must include both satisfactory facilities and transport for effective research as well as reasonable living, educational, and recreational facilities at or near field stations if research is to attract and hold qualified expatriate and national researchers. Local currency generated from PL 480 and other grant commodity programs can be used to support research in this way, including modest support for non-salary operating costs on a case by case basis. In addition, AID will endeavor to encourage other donors, in particular the World Bank and the African Development Bank, to contribute to improvement and expansion of facilities.

D. Integration of Efforts

In implementing the strategy existing AID projects (bilateral, African regional and Science and Technology Bureau), multi-donor supported projects such as the IARC's, as well as other bilateral projects should support the reorientation of national research programs through a coherent network of complementary projects within a given zone. This should all be done in close collaboration with African research directors, scientists and program administrators so as to ensure maximum relevance to national problems. This process will require some time to bring about and will only happen with multi-donor cooperation working through donor groups such as CDA. The research councils will play a key role in bringing about the integration of research within the zone into coherent research networks. AID financing for regional organizations and specific research programs should support such restructuring.

Within AID, the Science and Technology Bureau and BIFAD will assist the Africa Bureau to identify U.S. and other institutions and resources capable of undertaking the kind of research envisioned in specific country programs, recognizing that priorities may change once individual country programs become synchronized with broader zonal research programs. The S&T Bureau is expected to continue to implement centrally-funded relevant research and technical assistance projects which effectively provide back-up support for bilateral and regional research programs. The Africa and S&T Bureaus will closely coordinate and carry out research initiatives through joint working groups, joint research projects in specific problem areas, Collaborative Research Support Projects (CRSPs), and International Agricultural Research Centers, CDA, in consultation with national governments, AID field missions and African regional organizations, will select those countries which will receive special emphasis within each of the five ecological zones. The selection criteria will include the ability of the institution to undertake a broad-based research program, the country's agricultural production potential and the extent to which government policies favor integration of research, training and extension.

Although the agricultural research strategy emphasizes a zonal or regional approach, the majority of AID resources will consist of contributions to national research programs and country institutions through bilateral agreements. The respective USAID's will continue to manage these projects. Separate regional programs for the respective zones will support zonal coordination, zonal councils and zonal research programs, in part, through zonal liaison officers. The Agriculture and Rural Development Division of the Office of Development Resources, in close collaboration with Regional Affairs, other Africa Bureau Offices and the Science & Technology Bureau, will provide - through the project review process - the technical guidance and leadership necessary to ensure integration of the bilateral and regional programs.