Director of Research office

A Preliminary Draft of a Project Identification Document (PID)

BACKGROUND AND SUMMARY

This PID proposes a second phase of the Semi-Arid Food Grains Research and Development (SAFGRAD) project. SAFGRAD has been operating under the auspices of the OAU Scientific, Technical and Research Commisssion (OAU/STRC) since 1978. The original project paper approved a five-year activity from 1977-1981 and AID funding of $13.9 million. Amendments increased the AID funding of $19.1 million and extended the project to March 1985. A mid-term evaluation and an end-of-project evaluation concluded that implementation has produced numerous positive results consistent with and contributing to achievement of the project purpose and goal. The latter team recommended extending the project into the second phase and offered several recommendations as to program content.

The present PID proposed AID financing of $21.5 million over a five-year period. Although financing is planned for five-years, it is proposed that the project be conceived in a ten-year framework.

The project goal and purpose are broadened in keeping with current AID priorities and strategies and to more adequately reflect current realities of the African institutional setting.

The project goal, as stated in the SAFGRAD I project paper was defined principally in terms of increasing "the quantity and quality of staple food crops effectively available to the increasing populations in the semi-arid zones of Africa". This is now broadened to include the equally important element of increasing farmers' incomes and improving farmer living standards.

This provides a broader programming base than the more purely food crops orientation of the original project.

Although perhaps implicit in the initial project, the current statement of purpose explicitly provides for a greater institutional focus of the project. The original project emphasized specific research. Approximately 65 percent of all funds were spent for that purpose. SAFGRAD III will continue direct involvement in research; however, a greater proportion of resources will be used for strengthening national agricultural research/outreach systems of member states.

The essential elements of the project will remain as in the original project. However, significant shifts in emphasis among elements and details within elements are proposed. The main parts of the original project may be summarized as follows:

1. The establishment of teams of research personnel at appropriate research stations to (a) undertake specific research for improving varieties of the principal food grains and grain legumes, (b) develop improved cultural practices and soils/fertility/water management methods, and (c) conduct socio-economic studies within a Farming Systems Research (FSR) framework.
2. Establishment and support of mechanisms for linking research centers strenghtened by the project, other research entitites and the national research institutions of member states and for strenghtening ties between national extension/outreach and research.
3. Introduction of a system for more effectively relating research to farmers' problems through the FSR approach.

4. Long and short-term training of professional and technical staffs.

5. Establishment of management and coordination structures under the OAU/STRC for administrative and technical direction and management of the project.

The more significant changes from the original project which are proposed are as follows:

1. Important changes in administrative and management arrangement are proposed:

   (a) More clearly defining the responsibilities of the OAU/STRC-Lagos and the Coordination Office by assigning technical direction and management to the Coordination Office in Ouagadougou while financial and administrative management is assigned to OAU/STRC in Lagos.

   (b) Providing the SAFGRAD Coordination Office with the services of a Research Director (IFAD financed) and a Training and Extension Coordinator to be funded under this project.

   (c) Strengthening the administrative and financial role of OAU/STRC by making it a party to all contracts for services.

   (d) Strengthening the research direction and management role of the Coordination Office by negotiating agreements with contractor(s) providing for full integration of contractor(s) personnel into an integrated research team.

   (e) Strengthening the direction and management role of the Coordination Office with respect to the Accelerated Crops Production Officer

(ACPOs) by making that office along with the source of funding (SAFGRAD, bilaterial, etc.) and the country concerned a party to contractual arrangements for obtaining the services and support of the ACPOs.

2. Some conceptual changes are introduced:

(a) Providing a clearer conceptualization of SAFGRAD as an institution with an evolving role.

(b) Defining distinct roles for SAFGRAD in the three broad ecological-geographical zones into which member states fit. These are (a) the Sahelian, Sudano and Sudano-Guinean zones extending across the middle of Africa from the Atlantic to the Red Sea; (b) an East Africa zone; and (c) a Southern Africa zone comprising the SADCC countries.

(c) The ACPO role is seen as providing the linkages between national research systems and regional research whether by SAFGAD or other institutions and as providng the linkage between research and outreach within the national systems. The ACPO role can be seen as a precursor to a more structured FSR approach. Once the FSR is well establihed within any given national system there would be no need for the ACPO.

(d) The role of FSR is substantially redefined. Rather than having a Farming Systems Unit (FSU) as an entity distinct from the commodity and discipline research units, the entire research staff is seen as working as one team in which the discipline, crops and socio-economic specialists will be integrated within an FSR framework.

(e) A more liberal definition for low input technology is given to accommodate different ecological conditions and differences in cropping patterns. A clearer definition of the target groups is provided.

3. Some changes in emphasis and program content:

(a) The role of SAFGRAD in facilitating and coordinating regional research and in promoting exchanges among research workers and institutions (networking) will be given emphasis relative to its role in actually carrying out research.

(b) Greater importance will be given to research in soil fertility, water management, and other practices for reducing the risks associated with crops and animal production in regions of fragile soils and unreliable rainfall.

(c) Given that results to date suggest that soil fertility and moisture availability determine crop yield to a greater degree than does genetic potential, genetic improvement of crops will focus primarily on obtaining resistance to water stress, diseases and insects.

(d) Research on specific topics will be undertaken in priority areas which are not being adequately covered by national systems, regional programs or by the IARCs.

(e) Given that ICRISAT has established an important center for millet research in the Sahel and the intent of ICRISAT to regroup its activities on sorghum in West Africa, support for work with sorghum and millet at Samaru will be discontinued.

I. PROGRAM FACTORS

A. COUNTRY STRATEGIES

Each of the 25 SAFGRAD members has placed food self-sufficiency as a priority development goal. During the past 10-15 years, few of these countries have been able to maintain food production levels adequate to satisfy the increasing food demands from population growth. A second priority is increasing production of export crops.

The strategies as well as the implementation instruments adopted by different countries vary widely. Nevertheless the basic theme is essentially the same -- the application of improved production technology. To date these strategies especially with reference to food crops have usually floundered because the improved production technology was either (a) unacceptable to the farmer, (b) did not result in yield increases commensurate with the additional effort and inputs required, or (c) required inputs not generally or readily available.

The strategy has been more successful in the Sudano-Guinean zone where rainfall is more favorable and food crop production is more integrated with cash crops (cotton). While many exogenous elements affect the acceptability and utility of technologies which are promoted, much of the blame for non-acceptance must nevertheless be laid to the biological and physical limitations of the technologies themselves.

The failure of the SAFGRAD countries to produce sufficient staple foods, not to mention the decline in non-food agriculture, has serious implications for development. The well-being of some 70-80 percent of the population is severely compromised. Heavy outlays for imported food places serious strains on balance of payments to the detriment of capital goods imports. Food habits

of large segments of the population also become altered in favor of imported foods. The latter is particularly pernicious in that this creates a demand for food which the countries cannot, and in all probability will never be able to produce.

Thus, the failure of the agricultural sector and in particular the food sub-sector lies at the root of the rapidly deteriorating economic conditions of most of the Sub-Saharan African countries.

The development of applicable improved production technologies, the institutionalization of the process whereby continuing advance in technology development can be made and the institutionalization of mechanisms for promoting and achieving the widespread application of these technologies, though not sufficient, are at least necessary conditions for the achievement of the potentials of the agricultural sector.

B. AFRICA BUREAU STRATEGY

The SAFGRAD project is consistent with the broad AFR stragegy for fostering economic development in Africa. This is by encouraging regional cooperation among countries including the strengthening of regional organizations. More specifically with respect to the agricultural sector the project is consistent with two of the three broad policy objectives established by the Africa Bureau (AFR Bureau Strategic Plan of May 1983). These are "The building of self-sustaining African institutions that provide appropriate technology, inputs and services at the time and in the quantity necessary for effective production and distribution of food products"; and, "support for institutional and human resources development programs that provide the means for greater participation by farmers in the development

process, including policy planning, to build popular support and acceptance of programs necessary for self-sustaining growth".

In terms of providing orientation for selection of projects within the three broad program objectives, one of the three priority areas identified in the strategy statement is support for agricultural research. " - technology generating institutions have to be given a priority claim on resources because, without a viable base of farmer-acceptable technology (a production package), there is extremely limited opportunity for success of any other type of development effort, even policy changes". The direct involvement of the farming population in a FSR approach is a keystone in the AFR strategy.

The proposed program for SAFGRAD II is also consistent with the strategy of the Science and Technology Bureau. This strategy stresses strengthening the research capabilities of developing countries world wide, increasing the effectiveness of use of resources committed to research, and improving the relevance of research to production problems. The SAFGRAD approach emphasizes (a) research on priority problems for the semi-arid areas not being adeqately addressed, (b) cooperation among research systems of member states and with IARCs and (c) strengthening exchanges and linkages among these through networking. This is fully consistent with the Research Priority Implementation Plan (RPIP) for agriculture as promulagated by the S&T bureau with the approval and support of the AID administrator. The SAFGRAD II project is particularly responsive to the view that the "national programs can derive substantially greater benefit from available reserach if there is more regional focus of research activities, grater regional cooperation among participating countries and greater coordination among donors".

Within this general stragegy, two broad regional as well as numerous bilateral projects are being supported by AID. One, the multi-donor

Cooperation for Development of Africa (CDA) agricultural research initiative, covers the entire sub-Sahara areas except the Union of South Africa. The other, SAFGRAD, addresses problems specific to the semi-arid areas in 25 member countries. Within CDA, AID resources are concentrated in two areas -- the Sahelian group of countries and the Southern African (SADCC) group. The project designs for the two projects will be developed in close coordination and collaboration.

In sub-saharan Africa AID is currently supporting eighteen projects whose principal focus is agricultural research. Another 48 projects contain research components representing from 10 percent to 50 percent of cost. Among SAFGRAD member countries there are 40 bilateral research projects supported by AID. Research is the dominant element in seventeen of these. In addition, eight regional projects including SAFGRAD touch on some or all of SAFGRAD member states.

C. OTHER DONORS

SAFGRAD I has received support from two donors besides AID (FAC and IDRC). The non-AID contribution, however, has been small. A substantial contribution to SAFGRAD II is projected by IFAD. An initial contribution has been made by financing the Director of Research.

Numerous other donors are supporting research in SAFGRAD member countries through bilateral, as well as regional projects - (France, U.K, FRG, Belgium, Canada, the World Bank, UNDFP, FAO).

Five of the CGIAR International Agricultural Research Centers (IARC) have headquarters in Africa and one (ICRISAT) is establishing two permanent major

installations in Africa. Five other centers are involved in research in one or more of the SAFGRAD member states.

II. PROJECT DESCRIPTION

A. PERCEIVED PROBLEM

Low levels of production, poor yields and low labor productivity within an environment of unreliable rainfall, infertile and fragile soils characterize the agriculture, and particularly the food crop agriculture, of most of the semi-arid lands of Africa.

The recent advances in developing varieties and production practices for the major food crops have found little application in Africa These have involved either (a) a system of intensive production based on high levels of inputs and improved management of the environment though practices such as irrigation, or (b) an extensive system based on large scale mechanization which on balance yields a good return to labor and capital. In the semi-arid areas of Africa the production system remains extensive but on a miniscule scale. Production per unit of labor or per unit of land remains minimal, providing in many instances for bare survival.

The challenge to research in the semi-arid regions is to develop systems of production which increase returns to labor (incomes) either through technologies which intensify production on small farms or by technologies which enable the farmer to expand the land area cultivated (extensification)[1/]. In all probability, improved systems will include elements of both approaches.

1/ While the present population-land ratios in much of Africa will allow for expansion of extensive agriculture for the next 2-3 decades, continued population growth limits this approach.

It is not sufficient for researchers to produce improvements in production technology. Weak institutional capabilities of most SAFGRAD countries occur not only with respect to research, but also in assessing perceived problems, in testing and adapting technologies to farmer conditions and in dissemination of proven practices. Because of these, strenghtening of a whole array of institutions is essential to development efforts.

B. PROJECT GOAL AND PURPOSE

The goal of SAFGRAD II is to increase production of the basic food grains (millet, sorghum, and maize), and grain legumes (peanuts and cowpeas). This is to be done by improvement of varieties, by improvement of soil fertility and water management systems, and by the development of improved farming systems and practices which may include livestock production. Achievement of the goal and dissemination of the improved production technology will contribute to higher incomes and improved living conditions of the rural population.

The purpose of the project is to:

(a) Develop improved farming systems, including livestock and forage production where feasible which maintain soil fertility, reduce soil erosion and water runoff, and increase yields of food crops;

(b) Carry out plant breading and selection programs on grain and grain legumes focusing primarily on developing varieties resistant to moisture stress, insects and diseases;

(c) Establish mechanisms, in collaboration with regional research teams and national research organizations, for testing of new varieties and

verifying improved technologies, and for promoting communication between the various research entitites and institutions in the SAFGRAD countries;

(d) Verify and disseminate improved technology by on-farm testing under the ACPO (Accelerated Crop Production Officer) program;

(e) Strengthen food crop research capabilities in the SAFGRAD countries by short and long-term (degree) training of key staff members.

(f) Demonstrate and implement a system for linking national research and extension institutions through ACPOs.

In summary, SAFGRAD performs two distinct but related activities; an operational activity contributing to the development of technological innovations, and an institutional development activity. In Phase II increased emphasis will be given to the latter. A special effort will be made to expand the training program responding to particular needs of national research/extension organizations. Communication of research findings of regional interest among SAFGRAD countries will be fostered.

SAFGRAD is an instrument of an African institution (OAU/STC). As an entity almost totally supported from the outside, SAFGRAD is viewed as a transitory regional institution whose role will evolve over time. The initial direct involvement and active role in implementation of research and in conducting outreach and training activities should gradually give way to an increasing emphasis on coordinating research and facilitating exchanges and interactions among national agricultural systems as well as with other research institutions. The evolutionary process should accelerate during Phase II to the extent that after the ten years proposed for the project, coordination, information exchange and liaison should have almost completely

replaced its other roles. Eventually as the capability of national institutions is developed, the largely externally financed SAFGRAD should be replaced by dynamic African structures. This transition process will undoubtedly extend over a long period, measured in decades, during which continuous external support, albeit reducing over time, will be required.

C. EXPECTED ACHIEVEMENTS AND ACCOMPLISHMENTS

It is expected that:

1. Adaptive research will have developed farming systems that give increased production through maintenance of soil fertility, prevention of soil deterioration, better water utilization, and the use of improved varieties if available. These systems, some of which may include livestock production, can be adapted for use on the majority of farms in the different agro-ecological zones.
2. Drought resistant varieties of cowpea that can better cope with disease and insect problems are available and being used.
3. "Production packages" for cereal grains and grain legumes based on the use of minimal amounts of imported inputs will have been developed and are being extended for farmer use through the ACPO program.
4. An institutionalized system for exchange of agronomic research information around scientists in the semi-arid zones of Africa will be in operation.
5. About 100 short-term and 25 long-term participants trained by the project will be engaged in agricultural research or production programs in the SAFGRAD countries.

16. Regional planning and cooperation in agricultural research in the semi-arid zones will have become institutionalized.

D. PROJECT OUTLINE AND INPUTS

The phase II project will continue the principal components of the original project with certain modifications.

1. Administrative

The roles of OAU/STRC and the SAFGRAD Coordination Office in Ouagadougou are more precisely defined as follows: The OAU/STRC will be charged with definition and implementation of policy, in consultation with the Consultative Committee (CC), and administrative and financial management of SAFGRAD. The SAFGRAD Coordination Office in consultation with the Technical Advisory Committee (TAC), will be responsible for technical direction and management of the regional research program, the outreach program through the ACPOs, research and outreach networking and training. In order to perform these responsibilities, the Coordinator will be assisted by two senior technical staff, Director of Research (funded by IFAD) and a Training and Extension Officer (funded under this project).

2. The Research Center (Kamboinse) and Regional Research

(a) The Research Team

A multi-disciplinary team will be assigned to Kamboinse: The team will consist of eight research scientists selected among several disciplines: agronomy, soil science, plant breeding, agricultural economics, sociology, entomology, agricultural engineering and animal science. This team will be

complemented by 2-3 farming systems specialists funded by IFAD to work in the biological and social sciences. Provision is made for the assignment of scientists from member countries to work in associate or training capacities with the expatriate research team. Approximately 20 person years of such assignment is programmed.

The research specialists will work as a team under the guidance of the SAFGRAD Director of Research. The team will give priority to developing farming systems which increase production by improving soil fertility, reducing erosion, improving tillage methods, increasing water utilization efficiency, and using fertilizers and improved varieties where appropriate. A special effort will be made to investigate the feasibility of integrating livestock and forage production into mixed farming systems.

Plant breeding will focus on cowpeas, other grain legumes, sorghum and maize to select varieties with insect, disease, and drought resistance. Farming Systems research methodology will be an integral part of the research approach employed by the team. Selection of the particular researchable problems will be based on on-farm diagnosis of the principal constraints limiting production, the available and applicable technology in the areas of the constraints, and a thorough review of pertinent published and unpublished research. Research will focus broadly on the entire cropping program or farming system.

The objective of the team research is to develop systems of permanent cropping, combined with livestock production where feasible and economic, that maintain or increase yields and reduce soil deterioration. The production

systems developed should minimize the need for imported inputs and should be capable of being adopted by a high proportion of the farmers.

It will be essential that scientists assigned to this activity work as a team. To the extent that these are drawn from one or another of the IARCs or other institutions, the team approach should transcend the mandates of the institution from which they come.

An important role of the research team will be to foster, in cooperation with the SAFGRAD Coordination Office and member countries, the establishment of research networks among scientists and institutions concerned with common problems. Regional cooperation in planning, design and implementation of research will be major elements in this activity. Workshops on specific topics and informal interactions among scientists will also add to strengthening the research and outreach networks.

(b) Restructuring Research on Millet and Sorghum

With the establishment of a major research center by ICRISAT in the Sahel, research with millet within SAFGRAD will be limited to cooperating with the Niger millet program, in regional testing of varieties and to studies concerning the place of millet in farming systems, including regional testing of such systems.

Because of the many difficulties associated with ICRISAT work on sorghum at Samaru, this program will be discontinued as a part of SAFGRAD. SAFGRAD, however, will encourage ICRISAT to establish a sorghum program in West Africa. It is understood that the ICRISAT 1986 core budget contains positions for three sorghum researchers in West Africa. Efforts will be made at the PP

stage to define the cooperative role between SAFGRAD and ICRISAT in developing a long-term West African Sorghum Research program.

(c) Levels of Technology and Production Inputs

With respect to the level of inputs it should be recognized that to bring about reasonable and acceptable increases in productivity, it will be essential to introduce certain off-the-farm inputs and probably also to increase levels of farm inputs. Given the serious limitation on production imposed by the acute deficiency of phosphorous in most of the soils of the semi-arid regions, the application of phosphate fertilizers will be a requisite for increasing and maintaining yields. Adequate levels of available nitrogen must also be maintained. A wider range of options is available in the case of nitrogen than with phosphorus. Rotations, intercropping and relay cropping with legumes probably offers the best option short of use of imported chemical nitrogen fertilizers. A third critical need is to maximize the efficiency of water use. Intimately related to soil fertility and efficiency of water use is the maintenance of adequate levels of organic matter. Water management and organic matter maintenance are complicated problems and will require all the ingenuity that can be mobilized. A wide range of approaches should be investigated.

IRAT research extending over many years has provided considerable information on the principles underlying the soil deteriorating effects of continuous cropping and the use of chemical fertilizers. Certain techniques

to counteract these effects and which can maintain/improve productivity of soil under continuous cropping have been developed. Recent work by others, including SAFGRAD scientists, confirm the IRAT results. The application of the techniques/practices developed, however, remain largely beyond the means of the majority of farmers. While certain practices require only additional labor, the potential gain from these do not appear to be sufficient to attract farmers to apply the additional labor.

If any significant increases in productivity (yields) are to be achieved it will be necessary to increase the use of production increasing inputs, including on-the-farm (labor) and off-the-farm (better tools, fertilizers, chemicals, etc.). The often stated objective of developing a system of production capable of increasing production and productivity with zero or near zero inputs must be rejected.

Acceptable levels of inputs will vary with envionmental factors, especially rainfall and soils of different zones within the semi-arid regions. Under favorable conditions, higher level of inputs -- off-the-farm (fertilizers, chemicals etc.) as well as on-the-farm (labor) can profitably be applied to take better advantage of favorable environmental conditions (intensification). In zones with less favorable conditions, use of fewer and low risk inputs (mostly labor) should be preferred. It should be clear from the foregoing that a simplistic definition of the target farmer group(s) by the project is not appropriate. Rather the objective should be to reach the largest group for which there is a reasonable expectation that improved technology can be developed in a reasonable time and which that group will find profitable to apply. The levels of technology which may be appropriate will vary considerably with different environmental settings.

A concentrated program on the problems cited above will be the keystone of direct involvement of SAFGRAD in research. This is necessary because of the complexity of the problems and the requirement of a wide range of scientific specializations. The national research systems of few African states are able to address these problems alone.

Genetic improvement of varieties of the principal crops has been an important element of SAFGRAD I. Recognizing that production conditions most frequently preclude attainment of genetic potential in terms of productivity of most varieties, including many unimproved so called traditional varieties, it is clear that further efforts to increase the genetic potential of crop varieties with respect to yeilds should become secondary to other research. Genetic improvement to achieve resistance to insects, diseases, plant parasites (striga) and water deficiency stress will be emphasized.

(d) Farming System Research

Recognizing that FSR is a method of approach rather than a discipline and that FSR should be undertaken in close association with discipline and crop specialists, it is proposed that the research group work as a integrated team dealing with discipline and crops research within an FSR framework. Such a concept does away with a separate Farming Systems Unit (FSU) and avoids the tendency of separate units to become isolated from each other.

Further anaysis and synthesis of data collected during SAFGRAD I will provide a useful nackground for the FSR approach to be used by the team

proposed for SAFGRAD II. The FSR model developed by Purdue University, after appropriate refinement, could serve as a training instrument in SAFGRAD II.

IFAD is developing a project within the SAFGRAD framework that, in addition to financing the Director of Research in the Coordinator's Office, is considering establishing a FSR pilot program that will involve two researchers in each of three countries. The details of the project have not been developed so it is difficult at this time to fit it to proposed inputs by AID. However, from what we know of the general project purpose and structures, the IFAD proposal should fit in well with the AID project. In fact, we see the possibilities of fully integrating the IFAD inputs with those of AID. This will probably not be possible before the Project Paper (PP) stage of project development.

3. The ACPO Program

The ACPO program was conceived as a necessary tool for establishing linkages between regional research and national research as well as between research and national outreach/extension. An essential element of the program is the involvement of the farmer in implementation of certain steps of the research program.

The two SAFGRAD evaluations concluded that the ACPO program was one of the most important and in practice was considered highly successful. This was largely based on the performance of two outstanding ACPOs. These observations are significant in that they point to the need for individuals with exceptional qualitites on the one hand and the high potential impact which this type of program can have.

The ACPO program will continue in SAFGRAD II. Overall direction and coordination will be by the Director of Research and the Training and

Extension Coordinator in consultation with responsible officials in the respective host country, ACPOs will continue to be assigned to individual countries in response to country requests and as financing is available. It is proposed that SAFGRAD II finance a core program of 6 ACPOs in 8 countries. This program should be staffed by highly qualified expatriates who in addition to their regular assignment would provide training experience to selected individuals from other countries as well as to those of the host country. In this manner individuals can be groomed for assignment as ACPOs in other countries or for advanced training. Budgeting provisions are also made to finance 6 ACPOs to be drawn from among national personnel which have the necessary qualifications. Further expansion of the ACPO programs is seen as being financed on a bilateral basis.

A more precise conceptualization of the roles of the ACPO is suggested. The ACPOs role should be evolutionary and the function transitory. The first ACPO in a country should preferably be a well qualified expatriate. As the ACPO program develops and more nationals acquire experience, it should be possible to use nationals during the initial assignment.

During the initial period of a new assignment of an ACPO the primary function will usually be to estabish liaison between the regional research center and other external research entities (IARCs, other National Research centers) and the national research structure in the country of his assignment. Activities will consist chiefly of managing regional trials. Once a reasonable level of confidence in the technology being tested has been obtained, tests will be extended to farmers' fields. The farmers' fields should initially remain under the control of the ACPO and/or a local associate of the ACPO. The ACPO activities should be integrated with national research/ extension systems.

A second phase of the ACPOs work will involve creating linkages between the national research structure and the national extension entity.

During each of the above phases, in-service training should be provided to nationals. Selected individuals should be given advanced training qualifying them to replace the expatriate ACPO. As an approach for increasing the number of qualified ACPO personnel, promising individuals from member countires will be assigned in an associate/trainee capacity with experienced ACPOs. Budgeting provisions are made for developing 10 ACPOs through this approach.

4. Training

One of the proposes of the project is to strengthen food crops research and production capabilities in member countries by training key personnel. This will be accomplished in several ways. Short-term training totalling 600 person months will be given to professional researchers, research assistants and key extension personnel. This may include training at appropriate international research centers such as IITA, ICRISAT or other locations; participating in workshops; or monitoring visits to observe pertinent research and extension programs in other countries or regions.

Long-term training totalling 50 p/years will focus on Masters level candidates who have established work and intellectual credibility while working as counterparts on the project, as researchers or technical assistants in a crop production program, or have demonstrated the necessary qualities for M.S. level study as an undergraduate. African institutions will be utilized for this training to the extent that their training programs coincide with training needs.

Recognizing that it is highly desirable for national programs to develop their own capacity to plan and supervise food crop research, outstanding candidates will be considered for Ph.D. level training.

Workshops are a particularly useful forum for presentation of project research results of national or regional interest, for topical discussions led by specialists of recognized standing, for exchange of information and ideas among the cooperating scientists, and for outreach (ACPOs) oriented personel to exchange views and experiences with research staff. Two workshops are planned each year.

5. Role of SAFGRAD with respect to different geographical regions

With extension and/or potential extension of SAFGRAD to involve virtually all sub-saharan African countries with semi-arid areas, it is necessary to redefine the role of SAFGRAD.

By definition the project deals with problems of food grain and grain legume production in the semi-arid regions. This broad definition does not take into consideration the wide differences in the ecological settings of the vast areas involved nor the specificity of the principal crops concerned. The original concept involved primarily the semi-arid zones of middle Africa extending from the Atlantic to the Red Sea. This zone represents a relatively homogeneous setting within which there are different levels of rainfall both in amounts and distribution. SAFGRAD I has principally addressed problem in this zone.

The expansion of SAFGRAD to include countries in East and Southern Africa introduce substantially different ecological conditions from those in the West-Middle Africa belt. It is proposed that SAFGRAD II should program

actions in these three different zones at 3 different levels of intensity. The major emphasis should continue to focus in the West-Middle Africa belt.

The Southern African region has an effective organization (SADCC/CTC) which is being strengthened with assistance from numerous sources. It is believed that the institutionalization of research networking and outreach linkages within the region can most effectively be pursued through SADCC/CTC.

ICRISAT is mounting a major program on sorghum and millet research in cooperation with SADCC. A regional FSR program is being implemented by CIMMYT in the East as Southern Africa zone. A regional maize improvement program is also being initiated in the same area. A major grain legume improvement program is being developed in cooperation with SADCC. These programs should provide a sufficiently wide range of research and research networking for the Southern Africa region.

A SAFGRAD coordinator for sorghum and millet improvement is posted in Nairobi. This coordinator, provided by ICRISAT, has initiated a limited sorghum breeding program in cooperation with the Kenya Katumani station. He also maintains liaison with other national sorghum and millet programs in East Africa and has organized regional workshops. Contact is also maintained with the CIMMYT regional FSR and maize programs. These activities by the coordinator should adequately fulfill the networking function for this region.

OAU/STRC should play an important role in maintaining liaison, fostering the exchange of information and sponsring joint workshops among the three regions.

III. FACTORS AFFECTING PROJECT SELECTION AND FURTHER DEVELOPMENT

A. SOCIAL CONSIDERATIONS

The social implication of SAFGRAD can be far reaching. Over 80 percent of the population in the semi-arid areas are engaged in agriculture as their primary occupation. The SAFGRAD crops provide 75 percent of cereal foods in the semi-arid areas and more than 50 percent of the calories.

Production by the majority of the population is geared primarily to subsistance and secondarily to off-farm sales. In many instances because of the limited potential of available technology and the restricted means for its application, sections of the rural population seek off-the-farm employment to earn cash rather than invest additional labor to increase food production for the market. The implications of this is that as cash requirements increase with evolving social, cultural and economic obligations the labor available for non-farm employment will increase disproportionately to work opportunities. The result will be increasing social unrest, evidence of which is already widespread.

It has been determined that under existing production practices there are periods of peak labor demand which places a limit on total production. However, from considerations of family labor availabilities and the time required for operations during the peak periods, it seems that a greater amount of family labor could be available during these periods than is customarily mobilized. This appears to be at least in part related to the traditional division of labor, based on cultural considerations, among family members with respect to certain tasks. On the other hand, it is also probable that the marginal returns to additional labor inputs employing the traditional technology does not provide a sufficient incentive for mobilizing the extra

labor. Therefore, achieving an increase in overall production of food crops, or for that matter any agricultural commodity, will depend on developing technology which can increase the marginal returns to labor.

There is ample evidence that when opportunities exist for a sufficient increase in returns to labor, the cultural restriction on use of labor breaks down and greater amounts are devoted to the more productive undertakings. Witness the adoption of cocoa, coffee, tea, cotton, and intensive vegetable production as principal crops in many areas. The eventual breakdown of the cultural inhibitions to more effective application of family labor will occur when the returns to additional labor in the family enterprise will be at an adequate level, hence the need for technologies which increase the efficiency of labor.

Here the implcations are far-reaching. Adequate levels of incentive will stem the ever increasing movement of populations from rural to urban areas. The increasing urbanization of populations in most African countries has had a major influence in determining government policies. The cheap food policy is a good example of catering to the pressures of the urban population. The expansion of government employment is perhaps to some degree a response to increasing demand for employment by the swelling urban population.

B. ECONOMIC CONSIDERATIONS

The SAFGRAD program is designed to increase the production of food crops in the semi-arid zones of Africa. The primary food crops in these regions are sorghum, millet and maize. Groundnuts are used as food to a limited extent but are produced primarily for export or local processing oil. Cowpeas and

other legumes, while produced in limited quantities, are important to the diet and to the cropping system due to their nitrogen-fixing capabilities.

Maize is recognized as having greater photo-synthetic efficiency for food production especially in the West Central Africa areas, but is grown in limited quantities due to the heavy risk associated with its production in areas of unreliable rainfall. In the East Africa and Southern Africa regions maize is the dominant grain crop. Sorghum and millet have greater drought resistance; if drought occurs during the early part of their growing cycles, these crops can recover while maize crops are lost. For the West Central Africa region, it would seem that maize research should concentrate on a viable means of introducing the culture without appreciable increasing farmer's risk and especially for adaptability to the Sudano-Guinean zones where rainfall is greater and more reliable.

The expansion of maize production in the Sudano-Guinean zone in recent years suggests that this crop has the potential of substantially increasing grain availability in those countries with significant areas in Sudano-Guinean zone. Hence, the interest of improving maize production technology.

Substantial progress in improving maize production in the East and Southern Africa highlands has been made by current and previous programs. These programs continue with assistance of CIMMYT, AID and others. These programs generally have not affected the more marginal, lower rainfall areas where maize is an important crop. There is still a need for early maturing, drought resistant varieties which can be integrated into the farming systems of these lower production potential zones.

Scientists need to be concerned with the leguminous crops not only because of their importance from a nutritional point, but also because of the

low level of soil nutrients particularly nitrogen in semi-arid Africa, and the bleak prospects for greatly increasing chemical fertilizer use. Therefore, a balanced research program for food crops must include leguminous crops.

Overall cereal and grain legumes production represent approximately 75 percent of all lands devoted to crop production in the semi-arid areas and occupy about 70 percent of work effort of the farming population. The value of the grain and legume seed crops is difficult to estimate because of price controls applied to these crops in most of the African states and the frequently unrealistic exchange value of local currencies. Nevertheless, an approximation of the monetary value of these crops can be obtained by applying world market prices to the estimated tonage produced. For the cereal crops alone it is estimated that about 30 million tons are produced annually in the 25 SAFGRAD countries. At an average price of $100 per ton the total value becomes $ 3,000 millions.

The value of locally produced grain represent on even larger figure if this grain were to be imported and the high freight cost were added to the purchase price.

The SAFGRAD member countries were importing about 2,500,000 tons of cereal grains during the period 1976-78 (The USDA Report "Food Production in Africa and Prospects"). This represents about 8 percent of local production. A more recent study by the World Bank suggests that this figure has increased since the 1980 USDA study. In order to satisfy the demands in these countries for the traditionally produced food grains, an average increase in production of about 50 kg. per hectare or about 10% above current yields with a total current annual value of $_____ millions at world market prices would be necessary.

An increase in production by the tenth year of only ____ percent discounted to present value at the rate of 15 percent would be necessary to provide a break-even point or a C/B ratio of 1.0 for the proposed project.

Numerous economic analysis of cost and returns of of research have consistently demonstrated that internal rates of returns range from about 25 percent to over 200 percent. Even recognizing that because of the difficult environmental conditions in the semi-arid regions of Africa the rates of returns from research will probably be at the low end of this range, it is clear that the probability of an acceptable IRR is quite good.

C. Relevant Experience With Similar Projects

Although AID has, and is, supporting a number of bilateral agricultural projects with research components in Africa, experience with regional agricultural research has been limited. Research projects with a degree of similarity include maize improvement in East Africa, the West African Rice Development Association, (WARDA), and the Regional Cereals Improvement Project in North Africa (Morocco and Tunisia).

The maize improvement project in East Africa was successful both from the technical and economic points of views. The improved technology developed was soon put into use by both small and large farmers. At least two important lessons applicable to the proposed SAFGRAD project can be drawn from that experience. First, the successful development of a package of high-yield technology was the product of an interdisciplinary research team composed of plant breeders, entomologists, pathologists and production agronomists. Secondly, although research for the development of high-yielding maize was initially focussed on the needs of the large farmers, the technology (improved

varieties, use of fertilizers, plant pest and weed control) because of its profitability was picked up by small farmers as soon as credit for purchase of needed inputs was made available.

The West Africa rice research project may also suggest lessons for the SAFGRAD project. The regional nature of the project is largely the coordinating role of the headquarters staff facilitating the distribution and exchange of plant breeding materials from IRRI, IRAT and the national programs. Evaluation of the project indicates that the regional research has been good but management weak. What appears to be lacking is a core interdisciplinary research element, such as proposed in this PID.

Although created in a different agro-ecological and sociological setting, the Regional Cereals Improvement Project in North Africa produced a number for pertinent lessons. Perhaps the most important lesson was that although access to plant breeding materials from international sources is highly desirable, a considerable risk is taken when varieties from foreign sources are planted directly onto farmers fields without adequate local field trials. Secondly, the project showed the usefulness of intra-regional exchange of breeding materials, information on disease and insect problems, and cultural practices. Finally, the project demonstrated that successful coordination among and between national researh programs involves more than giving advice and guidance.

D. PROPOSED BORROWER GRANTEE AND/OR IMPLEMENTING AGENCY.

The project will be implemented by OAU/STRC with offices in Lagos, Nigeria. The OAU/STRC Executive Secretary is the principal executive office and is supported by an administrative and financial management staff.

The OAU/STRC will employ several instruments for project implementation: (a) a direct hire project coordinator and supporting staff in the coordinators office in Ouagadougou (b) contract(s) with appropriate entities (IARCs, U.S. Universities, etc.) for implementation of the research program and (c) contracts with qualified individuals, group of individuals, or suitable firms for implementation of the ACPO (outreach) program. The liaison, coordinating and networking function will be discharged by the International Coordinator and his senior staff.

E. AID SUPPORT REQUIREMENTS AND CAPABILITY

The project as structured will require a minimal of direct AID support. By charging the OAU/STRC office in Lagos with the primary responsibility for administrative and financial management, the AID role will be limited to assistance to OAU/STRC in contracting so as to assure that these contracts are consistent with AID policies and regulation. AID will also be responsible for timely evaluation and auditing. Both of these should involve primarily TDY personnel.

F. ESTIMATED COST

The estimated cost of the project is $21.3 million. Table 1 provides estimates of cost by principal category and percentage of proposed expenditure. Table 2 gives the basis for the cost estimates.

The project will be financial by a grant to OAU/STRC for costs related to coordination, research, short-term training, workshops and contain ACPO functions.

AID will finance directly the long-term training and ACPO function where the latter would most effectively be negotiated directly between AID, USAIDs and the respective countries.

TABLE 1

Estimated Costs (in $000)

Categories (1)	Annual Costs	LOP Costs	Percent	
Salaries and Allowances	1,890	(9,450)	53.3	42.4
Coordination (3)	270	(1,350)	(7.6)	(6.3)
Technical Services		~~(8,220)~~ 8,100		
Research (8)			(46.4)	(38.1)
ACPO program	720	(3,600)	(20.3)	
Expatriates (6)	540	(2,700)	(15.2)	
Nationals (6)	240	(1,200)	(6.8)	
USAID project mgr. (1)	120	(600)	(3.4)	
Training		3,200	18.0	15.0
Short term training in Africa, IARC etc. (600 p. mo.)	120	(600)	(3.4)	
Long-term degree training 50 P. Yrs	200	(1000)	(5.6)	
Research associates (Trainees) 40 P/yrs	120	(600)	(3.4)	
Work shops 2/yr	200	(1000)	(5.6)	
Commodities		1,775	(1.7)	8.3
Office equipment & supplies (coordination)	50	(300)	(1.7)	
Research & farm equipment and supplies (coordination)	120	(600)	(3.4)	
Vehicles (10 per year)	175	(875)	(4.9)	
Other Cost		3,305	18.6	15.5
Coordination office support	240	(875)	(4.9)	
OAU/STRC Lagos support	30	(150)	(0.8)	
Research Operations	240	(1,200)	(6.8)	
ACPO operations	180	(1080)	(6.1)	
Total Costs		17,730		
Contingencies and Inflation 20%		3,546		16.7%
Grand Totals		21,276	99.9	

[1]See attached for basis of cost calculations.

17,730

TABLE 2

Basis for Cost Calculations

Category	Annual Costs $ except where otherwise noted
1. Salaries and allowances:	
Expatriate personnel	90,000
AID project manager	120,000
ACPOs (national)	40,000
2. Training	
Short-term training in Africa institutions other Third Country, IARCs (for research and ACPO personnel)	1,000 /P/mo.
Long-term training (University)	20,000 /P/yr.
Research associate (on-the-job training)	15,000 /P/yr.
International work shops	100,000 each
4. Other Costs	
Support for coordination office	15,000 per mo.
Costs of TAC & CC	15,000 per meeting
Support for OAU/STRC Lagos	3,000 per mo.
Research operations including (labor, O&M, equipment & vehicles & P.D., networking travel)	20,000 per mo.
ACPO operations (support of materials travel & P.D., O&M vehicles & support	15,000 per mo.

Cost Breakdown by Programs

	Percent	
Coordination & Administration	18.4 + .9[1]	19.3
Research	30.5 + 2.0	32.5
ACPO	28.1 + 2.0	30.1
Training	18.0	18.0
		99.9

[1]Vehicle cost apportioned among the three elements.

A preliminary draft of a project identification document

AU-SAFGRAD

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