



SEMI-ARID FOOD GRAIN RESEARCH AND DEVELOPMENT  
RECHERCHE ET DEVELOPPEMENT DES CULTURES VIVRIERES DANS LES ZONES SEMI-ARIDES

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OF SAFGRAD MEMBER COUNTRIES

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AN OUTLINE OF MEDIUM AND LONG TERM PLANS OF SAFGRAD  
(A WORKING DOCUMENT)

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## OUTLINE OF MEDIUM AND LONG-TERM PLANS OF SAFGRAD.

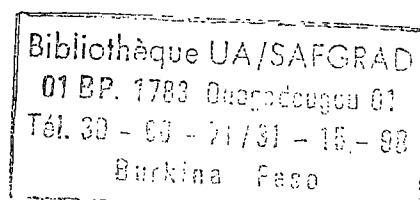
### I BACKGROUND.

The turn of the new decade (1990-2000) provides a good opportunity to review what has been accomplished and to take a hard analytic look at the complex agricultural production problems facing many countries in the semi-arid regions of Africa. It could also enable SAFGRAD to reorient its programmes to the needs of the region in the years ahead. In this document, therefore, attempt is made to outline the major thrust of SAFGRAD's long-term plan of activities.

Lack of progress in the increase of food production in Africa has been attributed to series of constraints largely of biotic, physical stresses and also of socio-economic nature. Africa's population growth (about 3% per year) is among the highest in the world and is not accompanied with a concomitant increase in per capita food production.

Food production needs to increase substantially in order to curb hunger, malnutrition, etc. which have continued to threaten the lives of millions of Africans. Past trends of crop cultivation need to be improved (or changed) and alternative efficient systems to increase food production will have to be adopted. Technological practices necessary for sustained higher levels of productivity, appropriate to the ecology and culture of the region, must be applied if the necessary rate of advance of agricultural production is to be attained. As reported within the recent World Bank Africa Agricultural Research Review Study (1987), financial resources and human talent with the required background and training for addressing these problems are limited. A "critical mass of scientific effort is needed to address these problems effectively". Few nations of the region have the resources necessary to carry forward the required quantity and quality of research (2).

The weakness of agricultural research in different countries in the region is not due mainly to lack of experienced researchers in particular and skilled manpower and funds in general, but also from poor and ineffective agricultural research policies at national and sub-regional levels. At the national level, the lack of effective staff management and career development policies combined with inadequate research operating funds had resulted in a disruption of even well designed research programmes and failure in building an effective indigenous national research capacity and extension system.



Owing to the cost and long-term nature of agricultural research, only a few countries in Africa can afford research strategies based on greater individual self-reliance and self-sufficiency. Moreover, there is growing recognition in the international community that efforts should be coordinated particularly at sub-regional levels if any tangible dividends are to be obtained from investments in research.

Considering the commonality of constraints to food grain production in the semi-arid ecology, the most logical approach would be for countries to coordinate research efforts such as pooling of scientific talents and resources in order to alleviate major constraints of agricultural production. The intensification of food grain research and production within National Agricultural Research Systems (NARS) would continue to be central to SAFGRAD activities through enhanced application of improved food grain production technologies.

This challenging task is made especially difficult since there are several barriers to agricultural progress in Africa including those of policy, weak capabilities of research and extension institutions to verify, validate and adopt technologies. Sustainable agriculture that could lead to self-sufficiency in food supply requires the support of minimum levels of scientific research based upon adequate research infrastructure, well trained, motivated scientific personnel and funds. Unfortunately, only few countries in the region could sustain critical levels of national research to adequately support national agricultural development.

The mechanism to sensitize and strengthen food grain research in different NARS was reorganized during the first Conference of Directors of Agricultural Research of SAFGRAD member countries at which the collaborative research network approach was adopted for regional cooperation in order to mobilize available resources such as those of the International Agricultural Research Centres (IARCs) and regional programmes to minimize duplication of research efforts and to reorient research towards the needs of the farmer.

Another main purpose for renewed interest in networking by member countries of SAFGRAD is the desire to break down linguistic and political barriers and to judiciously pool human, and financial resources together to solve common problems of agricultural production and productivity. Furthermore, SAFGRAD's emphasis is to bring to the forefront leading African scientists to provide leadership and conduct research in their areas of competence. The approach provides easy access to technical information. The network strategy takes into account the differences in the levels of research strength among national research programmes. In general, SAFGRAD would also utilize the network approach to improve weak areas of national research.

NETWORK MODEL

- (i) National Agricultural Research Systems (NARS)  
They constitute the major force and focus of the network. Their roles include: identification of common food production constraints, participation in the generation and evaluation of technologies (as lead centres), technical management of networks through membership of the Steering Committee, etc.
- (ii) International Agricultural Centres  
Their functions include: provision of technical backstopping by conducting fundamental and applied research to achieve network objectives: training of national programme scientists, facilitating the diffusion and exchange of relevant technologies, and, in cooperation with relevant agencies, to solicit funds for network activities.
- (iii) Coordinating Entity  
As an entity of the Organization of African Unity (OAU), SAFGRAD is uniquely placed and structured to serve as a secretariat for the various Steering Committees, the Management (Oversight) Committee, and the Council of Agricultural Research Directors. The primary role of SAFGRAD is to serve as the vehicle for the attainment of network objectives by facilitating interactions among scientists, institutions and participating member countries; facilitating mobility of germplasm and related technologies; acting as liaison between steering committees, international and regional organizations and NARS; and soliciting funds to support the strengthening of national agricultural research programmes.

The network model currently in practice not only facilitates the generation and evaluation of technologies, but it has also provided NARS with more knowledge of one another's research programme strengths and weaknesses. The four crop commodity research networks reorganized since 1986 (maize, cowpea, millet and sorghum) have enabled NARS to jointly identify common food grain production constraints of the semi-arid regions.

Since the restructuring of SAFGRAD collaborative research networks, respective steering committees have achieved the following:

- a) Developed and reviewed network research plans.

- b) Assigned research responsibilities to lead NARS based on availability of qualified research staff, optimum environmental conditions to screen varieties or elite germplasm resistant to particular biotic and abiotic stresses. Lead NARS have taken leadership and are being developed as future satellite "centres of research excellence".
- c) The research priorities and need for resource support of technology - adopting NARS was assessed in order to enhance their full participation in the collaborative research networks. The management of respective research networks by NARS has improved and has enabled NARS to assert their leaderships and capabilities in managing and conducting research.

## RESEARCH HIGHLIGHTS

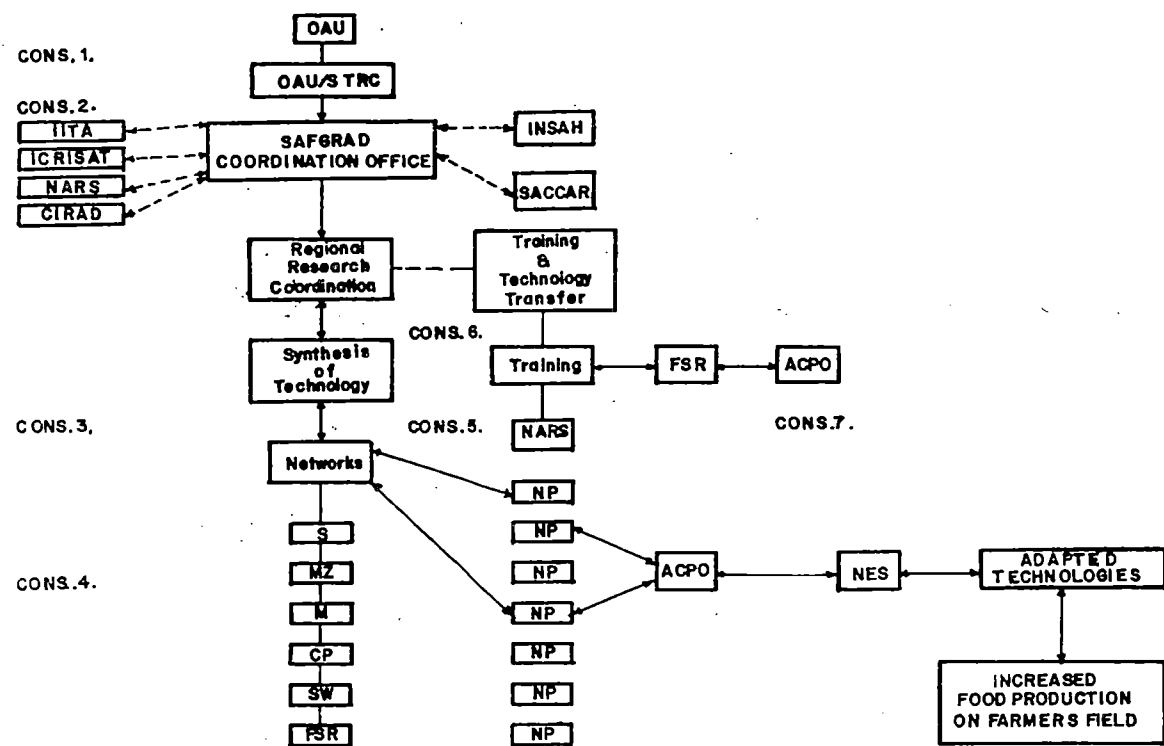
### Generation of Technology.

The scheme of generation and diffusion of technology of SAFGRAD is depicted in Fig. 1. Research emphasis within SAFGRAD has been focused on the development of suitable varieties and related technologies that could withstand particular biotic and physical environmental stresses that impede increased production of food grains. Some of the suitable technologies developed or evaluated through the SAFGRAD collaborative research scheme are summarized in Annex 1. The brief comments that follow reflect the research progress on the improvement of food grains since 1986.

(1) Maize The major constraints of maize production are susceptibility to maize streak, striga, drought and adaptability of suitable varieties. Since the restructuring of maize research networks, three categories of maize types have been evaluated and made available to participating NARS, i.e extra early, early and intermediate maturing varieties. These would be discussed in further detail by the network coordinator. During the last three years the number of regional trials conducted by NARS has been increasing. This has enabled NARS to identify suitable varieties for their respective conditions. Some of the varieties have been released and are at on-farm testing stage (7).

Most of the countries in the West and Central Africa region have relatively weak maize research programmes. Based on existing qualified researchers, physical facilities and optimum ecological conditions to screen varieties resistance to particular biotic and environmental stresses, the following NARS were assigned to provide research leadership in the improvement of maize (7,10).

Fig. 1. **SAFGRAD** collaborative research networks and transfer of technology scheme



- Consideration 1. Conductive Agricultural Research Policy at national and regional levels
- " 2. Viable collaborative research
- " 3. Assessment of available technologies and organizing network activities
- " 4. Identification of global research constraints and network sub-components
- " 5. Compiling and establishing data base on each national research programme
- " 6. Uninterrupted training, seminars and workshops
- Consideration 7. Technology Transfer programmes linking NARS and NES to obtain feedback on adoption.

SW	Soil & Water
NP	National Programme
S	Sorghum
MZ	Maize
M	Millet
CP	Cowpea
FSR	Farming System Research

TABLE 1. Lead National Research Centers for Maize Improvement.

Research theme	Agr. Station	NARS
Breeding for:		
Early maturity	Maroua	IRA/Cameroon
Early maturity	Kamboinse	INERA/Burkina
Intermediate	Niankpala	CRI/Ghana
Intermediate	Idessa	Bouake /Côte d'Ivoire
Resistance to Streak	Farako-Bâ	INERA/B.F.
Resistance to Striga	Maroua	IRA/Maroua
Resistance to Stemborer	Farako-Bâ	INERA/B.F.
Resistance to Stemborer	Idessa	Bouake /Côte d'Ivoire
Fertility Stress	To be carried out in all national research programmes based on the apparent food conditions.	

(2) Sorghum Sorghum is one of the important cereal sources of calories for over 250 million people in the semi-arid regions of sub-Saharan Africa. In West and Central Africa about ten million hectares of sorghum are cultivated. The major producing countries are Nigeria, Burkina Faso, Niger, Mali, Cameroon and Chad. In Eastern Africa close to eight-million hectares of sorghum are being cultivated. The major producing countries are Sudan, Ethiopia, Tanzania, Uganda and Somalia. Sorghum, however, is utilized in more than 24 countries in sub-Saharan Africa. According to (1984-1985) FAO report the over all annual production of sorghum in sub-Saharan Africa approaches to fourteen million tons.

More than any other period, there has been more free exchange of elite germplasm and related technologies among NARS. As a result, various types of regional trials (observation nurseries, preliminary and advanced trials) to screen resistant cultivars for specific biotic and physical stresses are being evaluated by different NARS both in West and Eastern Africa. Through collaborative research networks NARS are organized to promote research of mutual interest, and develop African leadership in sorghum research and management.



The Steering Committee of the Sorghum Research Network with the assistance of SAFGRAD and ICRISAT Research Scientists found it technically feasible to intensify improvement of sorghum research in National Lead Centres and other participating countries as indicated below.

TABLE 2. Lead National Research Centres for Sorghum Improvement in West and Central Africa.

a) West and Central Africa.

Research Themes	Lead Res. Station	NARS	Cooperating Station	NARS
i) Striga stress	Maroua Station	IRA/Cam	Samaru Sotuba	IAR/Nigeria IER/Mali
ii) Drought & fertility stress	Cinzana	IER/Mali	Maroua Maradi	IRA/Cam INRAN/Niger
iii) Grain mold	Farako-Bâ	INERA/B.F	Kano Samaru Sotuba Nyankpala	IAR/Nigeria IAR/Nigeria IER/Mali CRI/Ghana
iv) Long smut	Kolo	INRAN/Niger	Kano Berma	IAR/Nigeria IER/Mali
v) Panicle insects	SOTUBA	IER/Mali	Farako-Bâ Samaru Nyankpala Ferkessedougou	INERA/B.F IAR/Nigeria CRI/Ghana Idessa/C.I
vi) Stemborer	SAMARU	IAR/Nigeria	Farako-Bâ Kolo	INERA/B.F INRAN/Niger
vii) Grain quality (food)	SOTUBA	IER/Mali		INRAN/Niger & ICRISAT
Grain quality	SAMARU	IAR/Nigeria		

source (12, 13)

Eastern Africa Regional Sorghum and Millet Research Networks (EARSAM).

The focus of the improvement of sorghum in Eastern Africa region is to develop suitable varieties and hybrids for highland, intermediate and low land ecological zones. From the germplasm developed largely in the region observation and advanced yield trials for three above ecological are carried out by EARS.

The Steering Committee for this network was established in 1986 during the fifth regional workshop that took place in Bujumbura, Burundi. Based on sorghum research strengths of NARS as well as biotic and physical stresses in the region, the following national research programmes were identified to provide leadership for generating and evaluating technologies of common interest (14, 15, 17).

TABLE 2 (continued)

a) Eastern Africa Regional Sorghum and Millet Research Network.

<u>Research Theme</u>	<u>Sorghum</u>	<u>Lead NARS</u>
i)	Striga	Ethiopia
ii)	Ergot	Ethiopia & Rwanda
iii)	Crop Improvement	Sudan, Ethiopia, Uganda
iv)	Stem borer	Kenya (ICRPE) & Uganda
v)	Long-smut	Kenya

(3) Millet Millet is an important staple cereal as and source of calories in the diets of several million people. In Eastern Africa both the pearl and finger millets are cultivated. Uganda, Ethiopia and Kenya are the major producers of finger millet where as pearl millet is largely grown in the Sudan, Tanzania and Kenya. The cultivated area of these crops in Eastern Africa is about 2.5 million ha. According to FAO statistics (1984), over ten million ha of pearl millet are cultivated in West and Central Africa - particularly in Nigeria, Niger, Mali, Chad, Senegal, Burkina Faso, Cameroon, etc.. The constraints for millet production are largely similar to those of sorghum.

In general, millet improvement in NARS is weak. Thus far, improved lines introduced from India have, in general, shown poor performance in trials across the region, being susceptible to more virulent diseases (i.e mildew, ergot, smut, etc) and insects (shootfly and headbugs). Low soil fertility and lack of suitable varieties also constrain the increase of millet production.

(4) Cowpea Some technologies are available to alleviate salient constraints to cowpea production. These constraints of biotic, physical and socio-economic nature are quite complex in the semi-arid ecology. To enhance research on cowpeas, the Steering Committee of the network identified Nigeria, Burkina Faso, Niger, Cameroon and Senegal as lead NARS to develop varieties resistant to both biotic and abiotic stresses (8, 9, 11).

A number of varieties were developed that could alleviate particular stresses of cowpea production at different ecological zones. Regional cooperative trials (through the cowpea research network) are to address specific cowpea production constraints. These regional trials include observation nurseries (to identify resistance to aphids, bruchids, virus, fungus and bacterial diseases) and regional trials (to screen for drought and striga resistance). Varieties resistant to striga and to drought have performed consistently well over several years of testing. Cowpea agronomic research in conjunction with breeding programmes were carried out for several years in semi-arid regions. Cowpea intercropping trials were also conducted. These include relay cropping systems for maize/cowpea, sorghum/millet/cowpea and phosphate fertilization, effects of soil tillage, tied-ridges and residue trials.

#### FSR

SAFGRAD initiated three FSR pilot project activities in cooperation with national research programmes of Benin, Burkina Faso and Cameroon. The Benin FSR programme was operational between 1985-1987. The Burkina Faso and Cameroon FSR activities started also in 1985 and 1986 respectively will continue till April 1989.

The expected output of FSR support in the three countries was to develop understanding of the total farm environment and systems of production through identification of major constraints and providing solutions through uninterrupted research and technology evaluation. The support was expected to facilitate the evolution of integration of the sub-systems of production such as crops, livestock agroforestry etc.. and also to ensure the recycling of resources among these sub-systems of production in order to facilitate the development of sustainable agriculture.

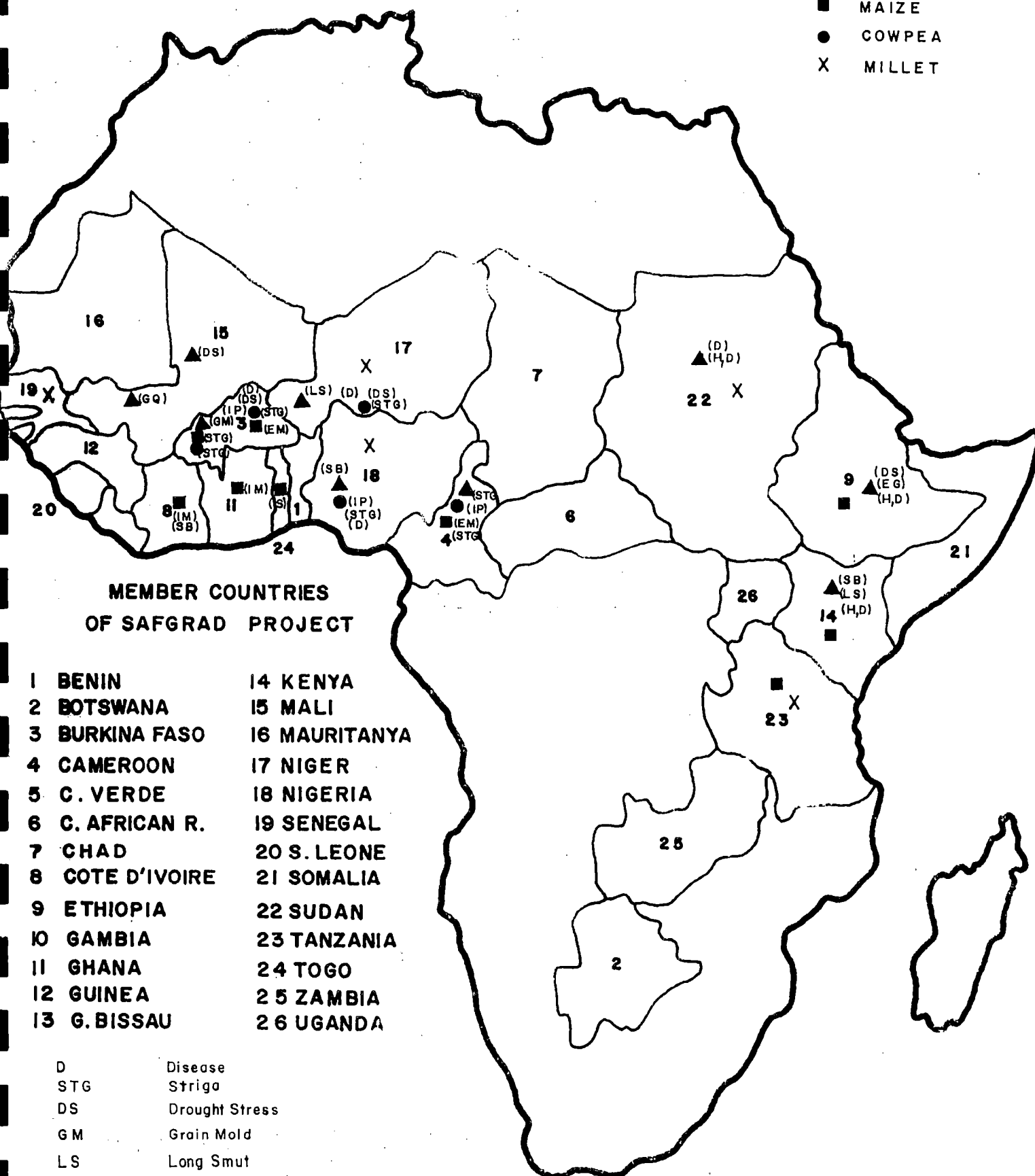
The major components of the FSR activities in the three countries therefore, included the improvement of the soil fertility, the evaluation of crop production technologies, increase of the utilization of natural resources such as pasture and animal power and products, and agro-forestry sub-systems of production.

Some of the accomplishments of FSR activities in the three countries (Benin, Burkina Faso and Cameroon) include:

- 1) The identification of food grain production constraints in the Mossi Plateau of Burkina Faso, in semi-arid regions of Northern Cameroon, and in Borgou and Atacora Provinces of Northern Benin. The existing farming practices of these regions were also described.

Fig. 2. Lead NARS Assigned Research Responsibilities of SAFGRAD Food Grain Collaborative Networks.

- ▲ SORGHUM
- MAIZE
- COWPEA
- X MILLET



**MEMBER COUNTRIES OF SAFGRAD PROJECT**

- |                 |               |
|-----------------|---------------|
| 1 BENIN         | 14 KENYA      |
| 2 BOTSWANA      | 15 MALI       |
| 3 BURKINA FASO  | 16 MAURITANYA |
| 4 CAMEROON      | 17 NIGER      |
| 5 C. VERDE      | 18 NIGERIA    |
| 6 C. AFRICAN R. | 19 SENEGAL    |
| 7 CHAD          | 20 S. LEONE   |
| 8 COTE D'IVOIRE | 21 SOMALIA    |
| 9 ETHIOPIA      | 22 SUDAN      |
| 10 GAMBIA       | 23 TANZANIA   |
| 11 GHANA        | 24 TOGO       |
| 12 GUINEA       | 25 ZAMBIA     |
| 13 G. BISSAU    | 26 UGANDA     |

- |     |                 |
|-----|-----------------|
| D   | Disease         |
| STG | Striga          |
| DS  | Drought Stress  |
| GM  | Grain Mold      |
| LS  | Long Smut       |
| SB  | Stem Borer      |
| GQ  | Grain Quality   |
| EG  | Ergot           |
| H,D | Hybrid, Disease |
| EM  | Early Maturity  |

IP Insects Pests

- 2) The project assisted the respective NARS to pursue multidisciplinary research in order to tune technologies suitable to resource poor farmers "target group" of the project.
- 3) The project assisted the respective NARS to develop and implement FSR programmes specific to their respective environmental and socio-economic conditions.
- 4) The on-farm trials carried out in the three countries demonstrated the need of multidisciplinary of research in order to integrate farm-level crop, livestock and agro-forestry sub-systems of production. This could be possible when recycling of resources of these sub-systems of production is established.
- 5) Technologies addressing some of the major constraints were evaluated and recommendations of technological options were made for the respective ecological zones and socio-economic domains in the three countries.
- 6) With regard to FSR capacity building, the project did encounter difficulties due to minimum commitment of assigning national research scientists to the project by the host countries. Furthermore, the short duration of the project combined with scarce resources devoted to training has, of course, severely limited the possibilities for building the national capacities.
- 7) Efforts to institutionalize FSR within the respective NARS was hampered partially due to different perceptions of FSR by scientists, research administrators and regular departments of national research programmes and extension departments of the respective countries.
- 8) The degree of uncertainty of donor support has also affected both the building of the research capacity and institutionalization of FSR. As a result, SAFGRAD is going through a painful period to withdraw its viable research FSR programmes from the above mentioned three countries. A key issue facing NARS is how best to continue targeted research like FSR for its sustained contribution to development. In addition to the need of allocating more resources by respective NARS to support FSR, donors must be prepared to take long-term views and avoid discontinuities in supporting research projects that inherently are long-term in nature.

#### WORKSHOPS AND CONFERENCES

To facilitate the exchange of technical information a number of workshops, conferences and seminars were held. Those organized since 1986 are presented in Table 3. Close to five

hundred scientists within and outside the continent were able to address research issues of mutual interest. Along with the crop commodity research network activities, on-farm research on appropriate technologies farmers workshop that was held in 1985 would be followed by another one that will be held in 1989. On farm research workshop was held in Maroua northern Cameroon where close to 80 participants from 18 countries attended the meeting. WAFSRN workshop for leaders or coordinators of FSR was held in 1988 in order to initiate and organize FSR activities in participating countries.

The primary objectives of the occasional FSR workshop is to assess agricultural technologies currently available in the region and to focus on technological needs and new avenues for research.

TABLE 3. OAU/STRC-SAFGRAD Workshops, Conferences and Seminars (1986-1988).

<u>Type of Activity</u>	<u>Year organized</u>	<u>Number of Participants</u>	<u>Countries &amp; Organizations</u>
1. International Drought Symposium held in Nairobi, Kenya	MAY/1986	110	30
2. Fifth Regional Sorghum and Millet Improvement Workshop held in Bujumbura, Burundi	JULY/1986	50	12
3. Directors of Agr. Conference held in Ouagadougou, Burkina Faso	FEB./1987	31	22
4. Maize and Cowpea Research Networkshop held in Ouagadougou, Burkina Faso	MARCH/1987	30	17
5. EARSAM Regional Sorghum and Millet Seed Production Workshop held in Nairobi, Kenya	SEPT./1987	25	10
6. On-Farm Research Workshop held in Maroua/Cameroon.	SEPT./1987	76	20
7. First Regional Striga Training Workshop held in Ouagadougou, Burkina Faso	OCT./1987	11	10
8. Six Regional Sorghum and Millet Improvement Workshops held in Mogadisho, Somalia	JULY/1988	55	8
9. West and Central Africa Sorghum Improvement Research Network held in Maroua/Cameroon	SEPT./1988	45	15
10. West African FSR Network Leaders' Meeting held in Ouagadougou, Burkina Faso	OCT./1988	35	15
11. Seminar on Cowpea Improvement held in IITA/Ibadan/Nigeria	NOV./1988	11	6

## TRAINING

Availability of qualified research and extension staff is key for the translation of research results into production. Many NARS need to give absolute priority to manpower training and development so that they could build up the desired level of "critical mass" of indigenous agricultural research capabilities. During the last decade, OAU/STRC-SAFGRAD has facilitated the training of various researchers from member countries. As of 1986, over 30 scientists were trained at higher degree levels (M.Sc. and Ph.D.) in various aspects of food grain research and production.

As of 1987, over 180 participants from different SAFGRAD member countries were provided with short-term training lasting from a few months to nine months in crop production technology. The problem of shortage of trained manpower, however, remains acute and wide-spread in many countries in semi-arid Africa.

Preliminary projections for research manpower requirements to strengthen collaborative research networks for the next 10 years within SAFGRAD countries are indicated in Tables 3 & 4. Short-term training requirements for Eastern African region in different aspects of crop production is as indicated in Table 3. The estimate is to provide the minimum manpower inputs considered necessary to sustain food grain research networks in semi-arid Africa. Previous training efforts focused on crop production conducted mainly at the IARCS with minimum involvement of national research centres and universities.



## II. OUTLINE OF SAFGRAD PROGRAMMES 1989-2000

SAFGRAD priority areas have evolved through continuous dialogue with NARS, research network entities, the Management Committee of SAFGRAD, donors and interaction with International Agricultural Research Centers such as IITA for the improvement of maize and cowpea; ICRISAT, for the improvement of millet and sorghum; ICRAF for agroforestry support; ILCA for livestock based farming systems and regional research coordination organizations like INSAH and SACAR. The capacity of SAFGRAD in general and its Coordination Office in particular is constrained due to lack of adequate support of technical manpower input and resources to fully implement programmes in its mandated area. It is, therefore, necessary for SAFGRAD to define or establish clear priorities on research and coordination activities of regional focus based on the needs of NARS.

In the domain of agricultural research, the global areas of SAFGRAD involvement would consist of strengthening NARS research base for the development of cultivars that are high yielding and resistant to specific biotic and abiotic stresses; to enhance research towards sustainable systems of production at relatively low levels of input by restoring the resource base for productive agriculture and promote research cooperation among NARS which have similar agricultural production problems; to facilitate the sharing of research facilities among NARS experiment stations; to improve the management and research skills of NARS through short and long-term training; and to promote the exchange of technical information and adoption of research results.

*forbidden*

The identification of certain NARS as lead research centres, increased leadership of the Steering Committees of the respective networks, the evaluation of the SAFGRAD Farming Systems Project, the impact study of the Accelerated Crop Production Programme and finally the mid-term evaluation of USAID-supported SAFGRAD activities have provided new dimension and impetus for reorienting and focusing the SAFGRAD programme activities in the years ahead. The major thrust of SAFGRAD activities within its long-term strategic plan (being prepared) are:

#### 1.0. Strengthening Support Services to Networks

Collaborative networks would continue to be central to SAFGRAD activities. As indicated earlier, crop commodity network research plan comprises all aspects of crop improvement of common interest. Within the network model, the expected output of such regional collaboration is to enable NARS to first, strengthen their respective research programmes and then provide more and more leadership in research and management of networks. On the other hand, it will take several years for most of the NARS to develop their research capacities to support sustainable agriculture. In the mean time, each collaborative research network by pooling together the scientific talents of various institutions could develop the desired level of research strength at a regional level in order to alleviate common food production constraints. Long-term plans for regional research cooperation within the framework of SAFGRAD network activities may consist of the following:

Phase I - Strengthening Collaborative Research Network (1989-1994).

#### Activities

- a) Expanding services to networks would entail technical, financial and administrative support. The services would include access to scientific and technical

information through establishment of network data bases; timely publication of network-related proceedings of conferences and seminars; support to the regular publication of agricultural research Journal in cooperation with WAFSRN; provide common administrative services to networks that might be too costly to obtain at the level of each network; assist NARS to fully participate in network activities and to discharge roles assigned to them such as serving as lead centres for the generation of appropriate technology; improve efficiency in the dissemination and exchange of technical information. The SAFGRAD Coordination Office should, therefore, improve its capacity to publish relevant research results of networks in French and English. An additional translator and editors (bilingual) and publication facilities are being sought.

- b) Develop a comprehensive plan for network development with special emphasis on

human capital development for NARS scientists in the networks;

identification and definition of research projects of regional interest and development of projects for donor support in consultation with the steering committees of respective networks, IARCS, SAFGRAD, etc.. Much progress has been made by completing the following projects for soliciting funds for network support:

<u>Name of Project</u>	<u>Solicited by</u>	<u>Submitted to</u>
(1) Proposal for supplementary funding of West and Central Africa sorghum re-search network	ICRISAT/SAFGRAD	SPAAR
(2) Project proposal for supplementary funding of West and Central African Cowpea Research Network	IITA/SAFGRAD	SPAAR
(3) Project for supplementary funding of Sorghum and Millet Eastern Africa Research Network (being completed)	SAFGRAD/ICRISAT	To be submitted to SPAAR

- |  |         |                          |
|--|---------|--------------------------|
| (4) Intensification of Food Grain Research and Development in West and Central Africa                  | SAFGRAD | To various donors        |
| (5) Project to be initiated for IFAD support to WAFSRN   | SAFGRAD | to be submitted<br>IFAD  |
| (6) Project to be prepared to reorganize and strengthen Eastern Africa Farming System Research Network | SAFGRAD | to be submitted<br>SPAAR |

Please note supplementary project proposal in support of maize research improvement delayed due to problems of networks harmonization.

Phase II - Towards Shifting Network Leadership and Management to NARS (1995-2000).

Network development at this stage depends much on what will be achieved during Phase I in strengthening the following entities of networks:

- . The extent of improvement of NARS research base;
- . The extent to which lead NARS were developed to be able to discharge regional research responsibilities to generate and evaluate technologies;
- . The extent of training support provided by respective NARS governments and donors to implement proposed long-term plans for human resource development;
- . More resource commitments to agricultural development and research by governments of respective NARS;
- . The extent to which an environment conducive to a productive research career has evolved to motivate NARS scientists to increase relevant research output for national development;
- . The extent of improvement of the capacity of the SAFGRAD coordination entity;
- . || The extent of reorientation of IARCS programmes to provide technical back stopping with sensitivity to shift network leadership and management to NARS.

The strategic plan (being prepared) would consider the above mentioned issues.

Networks to be reorganized or initiated

*NARS flavor*

- i) East and Southern Africa Maize Research Network in cooperation with CIMMYT and SACCAR.
- ii) The East and Southern Africa Farming System Research Networks in cooperation with SACCAR.
- iii) West Africa Animal Traction Network in cooperation with ILCA and WAFSRN.
- iv) West and Central Africa Millet Research Network in cooperation with ICRISAT.

2.0. On-Farm Adaptive Research (OFAR)

The first step towards eliminating the on-going food and agricultural crisis in the Sub-continent in general, and its semi-arid zones in particular, is to ensure that the majority of the ordinary peasant farmers in the sub-region shift to higher levels of agricultural technology. An essential input in this endeavour is, of course, the successful adoption of relevant research results by farmers.

With years of agricultural research activities in both the national and international agricultural research centres in the sub-continent, it was assumed that, while efforts should be intensified in identifying and generating agricultural technologies that are suitable and relevant to the agricultural systems in the sub-continent, there already exists on the shelves of these research centres or elsewhere, improved technologies that can be adopted, perhaps with slight modifications, by the majority of the peasant farmers.

The Accelerated Crop Production Programme (ACPO) was SAFGRAD's response to a perceived weakness of crop research programmes "in getting research results disseminated, tested, adapted and to the farmer". ACPO activities have been in the following three main categories:

1. Conduct field trials and studies under various conditions to test the adaptability, deficiencies and potential of various recommended crop varieties and practices;
2. Provide a linkage to crop research and development programmes elsewhere in the region to enable the participating country to benefit from and contribute to regional progress;

3. Provide coordination between national research and extension/development agencies in arranging for broader national testing and demonstration of those varieties and cultural practices that appear technologically superior and otherwise suitable.

Lessons learned from the impact study of the SAFGRAD ACPO programme activities (in four countries) seem to indicate that (6):

- a) The concept of the project providing a link between national research and extension is sound and more relevant today than ever before, in the face of the continued difficulties many African countries are still facing in trying to get the majority of their farmers to move into higher levels of agricultural technology.
- b) Most of the farmers in the project area were able to attain yield increases of food grains. The factors contributing to the perceived increases in yield varied from crop to crop and from country to country. In most cases, the use of improved cultural practices and fertilizer were identified as most important factors.
- c) The ACPO programme has succeeded in institutionalizing the technology transmission and diffusion process in the countries it was operational.
- d) Low resource agriculture would continue to be the centre of the SAFGRAD on-farm adaptive trials. Most farmers in member countries do not have the resources to apply a high level of inputs since the level of risk that farmers could take is very low.
- e) Despite the general awareness in each country of critical requirements of institutionalizing an effective and agricultural technology adapting and transfer mechanism, most countries have yet to put more resources as a priority area. Regional support to facilitate the realization of the process is necessary for a long time to come.

The relative success of the ACPO programme has been its organizational simplicity and focus to promote multi-location trials, improve linkages between research-extension and farmer. The focus of the new project would be to speed up the process of the transformation of research results into extension recommendations and production. SAFGRAD would continue to play a catalytic role in the institutionalization of the technology adoption and transfer mechanism among participating member countries.

At regional level, the current project objectives are:

- a) Improve on-farm research methodology and approaches to enhance adoption of technologies,

- b) Facilitate the review of on-farm research plans and experiences,
- c) Provide training (both in-service and short courses) for on-farm testing experts and technical staff and assist member countries to conduct their own training.
- d) Assist NARS to set in motion a Testing and Liaison Unit (to promote on-farm research).

### 3.0. Establishing Functional Linkages Among Semi-Arid Agricultural Experiment Stations.

Cooperative research among institutions is essential for sustained agricultural research, particularly among smaller and weak national research programmes. The national research stations, already located in different locations of semi-arid ecological zones, have the potential to develop technologies for wider adoption. With the exception of a few agricultural research stations, many of them lack both qualified researchers and resources to carry out minimum agronomic research. Even those few research stations with good research programmes, are in difficulty to sustain their research activities mainly due to lack of funds and unfavourable agricultural research policies. The overall objective of the project is to improve the research output of experiment stations through joint research activities and complementary projects. The achievement of this objective will require a redefinition and reorientation of research policies and strategies of member countries. Focused but substantial research support to agricultural research stations could lead to strong regional cooperative research activities. Establishing good research working relationships among national agricultural experiment stations could help to:

- a) strengthen cooperative research among Agricultural Experiment Stations to fill research gaps or share the services of expensive research equipment that may be available in few of the national research stations.
- b) promote research cooperation for screening resistant cultivars to biotic and abiotic stresses.
- c) promote the improvement of experiment station management through specialized workshops and training for research administrators.
- d) facilitate the exchange of research workers with knowledge in some of specialized skills.
- e) facilitate the realization of multidisciplinary research teams consisting of highly qualified scientists from different research stations.

- f) promote short and long-term training such as conducting short courses using station facilities and also to facilitate thesis research for graduate degree and post doctoral research fellows.
- g) promote the exchange of information among experiment stations.

Initially, a general conference of the Directors of Agricultural Experiment Stations located in the semi-arid regions will take place (in 1990) in order to inventory on-going research programmes, manpower, research facilities, services as well as resource requirements. Furthermore, research gaps and deficiencies of the cooperating stations would be identified. Institutional activities of a complementary nature would be outlined. The modalities for the association of the participating agricultural experiment stations would be developed.

#### 4.0. Training.

A preliminary assessment of training requirements of research personnel (World Bank report) seems to indicate over 5000 by the year 2000. As indicated in Table 4, close to 550 additional researchers would be needed to support food grains research in West and Central Africa during the next decade (World Bank 1986/87). According to the estimates of the EARSAM research networks (Evaluation Report 1986/88), requirements for sorghum would be 160 researchers (25% at Ph.D level, 31% at M.Sc level and 44% at B.Sc level) and 115 technicians; pearl and finger millet research in the same region requires 46 researchers (20% at Ph.D level, 40% M.Sc level and 40% at B.Sc level) and 47 technicians by the year 2000 (Table 3).

Agricultural research personnel requirements during the next decade for West and Central Africa region is indicated in Table 1. The network estimates at higher level of research training varied from 14 to 23 for maize and about 51 for sorghum and millet (SAFGRAD estimates) and that for cowpea over 20 researchers (M.Sc and Ph.D levels) would be needed by the year 2000.

During this decade that agricultural crisis in Africa has been the major preoccupation, donor support to research in general and high level research degree training has declined. It is therefore, important for member states Governments and donors to review their policies and put more resources to improve the capacity and capability of training institutions such as national universities and agricultural colleges, as well as that of agricultural experiment stations - in order to the trained required technical research and extension manpower to support development.



TABLE 3.

EARSAM. Training Requirements for next 10 years (1989 to 1999) for Sorghum (S) and Millet (M) Improvement Research Networks.

<u>Country</u>	Ph.D.	M.Sc.	B.Sc.	Technical	
BURUNDI	7(S)	4(S)	5(S)	5(S)	
ETHIOPIA	5(S) 1(M)	5(S) 2(M)	9(S) 3(M)	16(S) 6(M)	
KENYA	5(S) 2(M)	12(S) 9(M)	17(S) 10(M)	21(S) 17(M)	
TANZANIA	5(S)	9(S)	14(S)	14(S)	
UGANDA	5(S) 5(M)	8(S) 6(M)	12(S) 10(M)	25(S) 20(M)	
SOMALIA	8(S)	7(S)	10(S)	20(S)	
SUDAN	3(S) 1(M)	3(S) 1(M)	- -	9(S) 4(M)	
TOTAL:					
	Sorghum	36	51	71	115
	Millet	9	18	21	47

Source: (17)

Agricultural Research Personnel Requirements (1989-2000)  
in West and Central Africa.

Country	Number of Researchers by crops						Source
	Maize		Sorghum & Millet		Grain Legume & Oil Crops		
	WB	NW	WB	SAF	WB	NW	WB= World Bank Report NW= Networks Reports
BENIN	12	4	5	2	7	3	
BURKINA FASO	8	2	15	4	12	2	
CAMEROON	15	-	14	3	15	3	
CAPE VERDE	1	1	-	-	2	1	
CENT. AFR. REP.	2	3	3	2	6	-	
CHAD	1	-	8	3	6	1	
COTE D'IVOIRE	4	2	7	2	8	-	
GAMBIA	1	2	3	-	6	-	
GHANA	15	1	11	2	15	3	
GUINEA	5	2	4	2	12	2	
GUINEA BISSAU	-	2	1	-	3	1	
MALI	12	2	30	10	20	2	
MAURITANIA	1	-	4	2	4	-	
NIGER	1	-	12	4	8	2	
NIGERIA	50	-	60	8	50	2	
SENEGAL	6	1	20	4	25	1	
SIERRA LEONE	4	-	4	-	6	-	
TOGO	8	1	8	3	10	-	
<b>TOTAL</b>	<b>146</b>	<b>23</b>	<b>209</b>	<b>51</b>	<b>215</b>	<b>23</b>	

Source: West Africa Agricultural Research Review, 1987 World Bank, West Africa Department, Washington D.C.

West and Central Africa Maize and Sorghum Networks Workshops and Steering Committee Meetings.

SAF - SAFGRAD Estimate

OAU/STRC-SAFGRAD in this regard has a primary role in assisting NARS to identify needs and resources and to facilitate training activities.

SAFGRAD would further establish formal training arrangements with selected African Universities and institutions of higher agricultural education in order to utilize them for specialized and relevant training of researchers and technicians. In order to develop a long-term training plan for SAFGRAD mandated activities, the following activities would be undertaken in 1989:

- 1) Fielding of consultants to undertake a training needs assessment study.
- 2) Establish a small working group of qualified experts from (SAFGRAD member countries) to
  - . Assess training needs and research priorities of the region,
  - . Assess the research manpower requirements for different categories of research activities,
  - . Assemble basic data on research and technical manpower requirements for major NARS research stations,
  - . Collect basic data on potential training institutions in the region (i.e. Universities and national research institutions) and propose strategies by which more training at NARS Institutions could be accomplished,
  - . Collect information on donor support at bilateral, regional and international levels for different types of training,
  - . Recommend a training plan and resource requirements for the next decade.

#### 5.0. Addressing Agricultural Research Policy Issues

Most governments in sub-Saharan Africa have yet to be convinced that investment in agricultural research could be profitable in the long term.

In a number of countries where major break throughs in crop production have been achieved, the rate of return on investment on certain types of agricultural research was reported from 20 to 90% per year (16). Such a return on investment has been attained when break throughs in the development of high yielding cultivars were accompanied with conducive agricultural policies. To make research more relevant to development needs of the sub-region, the following issues should, perhaps, be examined:

- a) Are research programmes targeted to farmers' needs and economic resources? What types and levels of technologies would fit the farmers' practices? i.e. i) low resource management modifying existing technologies to local conditions. Thus, no substantial increase of yield is expected, ii) technologies that require medium to high level input "management" where substantial yield increase is expected.
- b) Is the weakness of agricultural research in NARS been mainly a matter of shortage of qualified researchers and funds? These may be major constraints. But a study of the World Bank indicated that the number of research scientists in sub-Saharan Africa did increase from 1600 to 4000 during the decade 1970-1980 at the rate of 10% per year (18). This was relatively higher than Asia and Latin America. In the same study, it was pointed out that expenditures to research per scientist in Africa was also high compared with those in Asia and Latin America. These comparisons, however, may not have taken into consideration that the development of research institutions in those continents has taken several decades and did already attain a critical research mass to support rural development in general and agricultural development in particular.
- c) One school of thought is that technologies are available on shelves but have not been effectively disseminated to farmers. Internal institutional organizations, administrative and policy problems at national and regional levels have contributed to lack of progress of application of research results to improve the income of farmers. Some of these problems are:
- i) The isolation of researchers from extension agents and farmers due to institutional barriers.
  - ii) The transfer and adoption of technologies to the farmer depends on supportive government policies. Lack of conducive national policies in favour of the agricultural sector (3). Although there is greater willingness than before for governments to undertake policy reforms, more resources have yet to be allocated to the agricultural sector to accelerate production.
- d) Inability to use more efficiently existing research capacity and too much dependency on external support (donors) have caused a certain degree of uncertainty to continue viable research projects. There is underemployment of highly qualified researchers in some NARS due to lack of budget. On the other hand, the same research activity may be continued using expatriate staff through donor support.

As soon as donor support is withdrawn, research is not sustained. More resources to research need to be allocated by respective governments in order to develop sustainable agriculture.

e) "Minimal Critical Mass of Research" is Prerequisite to Maximize Benefits from Research

This situation first could be met initially at regional level since it would take several years for each NARS to have highly qualified researchers in the desired numbers. For an experiment station or regional centre it would require five to eight agricultural disciplines and at least two senior scientists from each discipline to effect "critical research mass" (16) provided that the research scientists devote themselves to the most urgent problems of agricultural production.

f) The Productivity of Research is Much Influenced by the Established System of Research Policy of Employment

Many of the NARS have yet to develop research career systems that could encourage scientists to make research work as their long-term professional activity. This situation certainly varies from country to country. In general, individual scientist's commitment and professional dedication is the key for research organization to fulfill its objectives. Scientists, therefore, should be supported by improving the research environment and living conditions. Productive research requires an organization that encourages staff interaction, a style of administration which emphasizes leadership more than authority (16).

SAFGRAD as an agency of the OAU could actively promote discussion on agricultural policy issues in order to influence member countries to allocate more resources to agricultural research in particular and development in general. A conducive policy environment to agricultural development could increase not only food production but also enhance support to agricultural development.

In cooperation with various agencies, SAFGRAD intends to use the OAU mechanism to organize an Agricultural Research Policy Conference for the 26 SAFGRAD member countries. Initially, the main themes and issues of the workshop would be identified by consultants that would prepare a working document.

#### 6.0. Forthcoming Africa Wide Conferences

Provided funds are solicited successfully and working documents by group of experts are elaborated, the following Africa Wide Conference and Seminars would be organized:

- i) Agricultural Research Networks Reviews (1990/91)
- ii) Research Policy Issues Conference (1991/92)
- iii) Workshops for Semi-Arid Expt. Station (1990/91)
- iv) Directors of Agr. Research Conference (1991/92)
- v) Training Needs, Plan and Development Regional Seminar (1990).

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# An outline of medium and long term plans of SAFGRAD

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