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**EVALUATION REPORT**

**STRC/CAU JOINT PROJECT**

**J.P. - 26**

**MAJOR CEREALS IMPROVEMENT PROJECT**

**WEST AFRICA            AID 625-11-130-305**

Washington, D.C.

July 25, 1973

# MAJOR CEREALS IMPROVEMENT PROJECT - WEST AFRICA

## TABLE OF CONTENTS

	<u>PAGES</u>
I. Introduction	1
II. Summary Recommendation	2
III. <u>Background</u>	
A. Project Setting	4
B. Previous History	5
IV. <u>Funding, Staffing and Resources</u>	
A. U. S. Contribution	6
B. Nigerian Government	7
C. STRC/OAU and Participating Countries	7
D. Other Donor Assistance	8
V. <u>Project Purposes and Goals</u>	
A. General	9
B. Main Project Components	10
VI. <u>Progress Achieved</u>	
A. Technical Services	13
B. Participant Training	17
C. STRC Coordinating Unit	17
D. Field Trials Officers (FTOs)	18
	18
VII. <u>Organization, Management and Training</u>	
A. Scientific and Research	19
B. Project Management	19
C. Participant Training	23
VIII. Future Prospects	25
IX. <u>Appendix</u>	
A. Criteria for Evaluation Team	27
B. Logical Framework Matrix	29

## I. INTRODUCTION

This report was prepared by a four-man team organized by AID and STRC to conduct a special, in-depth evaluation of the progress achieved thus far and to make recommendations for the remaining life of this project, initiated in FY 1964 and now scheduled for termination in its present form at the end of FY 1975. The evaluation study was conducted during the period May 18 - June 15.

Upon assembly in Lagos, the team attended an STRC briefing on Project J.P - 26; proceeded to the USDA Team headquarters at IAR in Samaru; and thereupon visited five other participating countries: Niger, Upper Volta, Senegal, Cameroon, and Chad. Enroute, the team toured research and field stations at IITA, Ibadan; Kano State Farm; IRAT/Terna at Marsadi, Niger; IBAT/Bamby in Senegal; and IRAT/Marcus in Cameroon and held meetings with key government officials, STRC and USAID representatives, researchers, advisors and related technical personnel in the countries visited.

Included in the report's Appendix are the List of Evaluation Criteria, or the frame of reference for this study and a Logical Framework Matrix for use in regular annual project evaluations, or PARS.

The evaluation team members participated jointly in the drafting of the recommendations contained herein and the main body of the report but Parts V and IX were completed by the AID member after the other team members departed Lagos on June 15.

The evaluation team expresses its sincere appreciation to STRC and USAID offices in Lagos and Niamey, IAR and PASA Team in Samaru; the governments of the participating countries and the regional research organizations for the warm hospitality and excellent cooperation extended in the conduct of this study.

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## II. SUMMARY RECOMMENDATIONS

### A. Strengthening Capacity of STRC Coordinator's Unit

1. A bi-lingual agronomist or other trained agricultural specialist should be added to the STRC Coordinator's staff as soon as possible to coordinate at the technical and operational levels the activities of PASA Teams, FTOs and project seed multiplication stations. He may also serve as the secretary for the proposed project Executive Committee on Research and Training.
2. The evaluation team welcomes transfer of the AID Project Manager to Legon which should improve project implementation, strengthen STRC's coordinating role in the project and facilitate closer contact with PASA and FTO personnel.
3. STRC is encouraged to proceed with the planned 1973 "Conference on Research Needs for Increased Cereals Production in West Africa" and the establishment of an Executive Committee on Research and Training Needs. However, this conference should not exclude continuation of the regular bi-annual seminars for researchers, plant breeders and related technical personnel.

### B. Field Trials Officers

4. STRC should attempt to add one or two bi-lingual FTOs to its staff, particularly for the Francophone countries. When this is feasible, FTOs should be re-assigned to stations in homogeneous geographic regions where the most effective logistical support can be arranged.
5. STRC, through the proposed Executive Committee, should urge each participating country to designate a trained agricultural technician to serve as its Field Trials Officer in liaison with Project J.P.-26 in the conduct of Regional Field Trials and related project operations.
6. The participant training program should take careful account of this requirement for individual country FTOs.

### C. Research Program-Dissemination of Results

7. PASA Teams and IAR, in cooperation with IRAT and IITA should devise, based upon latest research information available, a package of crop production practices for each cereal - sorghum, millet, and maize - in the principal ecological zones of Central and West Africa for the information and use of extension specialists and farmers.
8. The STRC/OAU Publications Bureau in Niamey should expedite distribution of the planned bi-lingual "Quarterly Cereals Bulletin", the first issue of which is anticipated in July, 1973.
9. Until the STRC Quarterly Cereals Bulletin is actually in print, the STRC Coordinator's Unit with help of FTOs should organize full distribution in English and French of the J.P.-26 Project research results currently reported in the IAR Seminars Newsletter.

10. The STRC staff should include one French-English translator with a solid technical background in agronomy or general agriculture to help translate J.P.-26 documents and reports.

D. Administration, Logistical Support and Training

11. To provide necessary logistical support for the PASA Team, an administrative assistant should be provided through service contract or local or third country national employee. If this cannot be managed, an American administrative assistant should be added to the PASA team.
12. PASA Team and IAR should further explore with IITA and IRAT possibilities for a short term training course in French and English for national field trials officers and related participating country technical and research personnel.

III. BACKGROUND

A. Project Settings

During the 1960 decade food production in West Africa had been increasing at about the same rate as population and was generally sufficient to satisfy the food needs of the people at traditional nutritional levels. However, traditional technology was not adequate to meet the projected future food requirements of the area with population in West Africa increasing at an estimated 2.5 to 3.0 percent yearly.

Also, there was and continues to be a deep concern about the quality of human diets. Plant and animal protein deficiency as evidenced by widespread diseases and human body abnormalities and deformities is still serious throughout much of West Africa where starchy root crops characterizes the prevailing diets. An improvement in the quality and quantity of protein, if bred into new varieties, could supply higher quality plant food for the growth of children and the health of adults. Furthermore, the expansion of staple cereal production beyond human requirements would permit increased feeding of high-quality grains to livestock and poultry thereby also providing more animal protein foods.

The table below summarizes statistical data for 1967 and 1968 combined acreage and production for 14 of 16 countries (plus Guinea) participating in this Regional Major Cereals Project. At that time only a few trained scientists were engaged in plant breeding: for millet; only one each in Nigeria and Senegal; for sorghum, one each in Nigeria, Senegal, Niger and Cameroun; and for corn/maize, 2 in Ghana and one each in Nigeria, Ivory Coast and Dahomey.

TABLE I

Three Cereals Area and Production Totals For Fifteen West African Countries Combined

	<u>Sorghum/Millet</u>	<u>Maize</u>
Hectares, 1967 (000s)	16,327	2,329
<u>Production (000s) TONS</u>		
1967	11,305	2,998
1968	11,577	2,994

More recently, the staple food situation in West Africa has been further complicated and badly aggravated by a series of consecutive drought induced crop failures culminating in the most serious famine in 1973. Recurrent crop shortfalls or failures were not uncommon here in the past but the 1973 drought is the worst in sixty years. Short and untimely rainfall patterns coupled and interacting with the gradual encroachment of the arid desert wastelands has caused widespread hardship, especially in the six countries of the Sahel zone, viz: Senegal, Mauritania, Mali, Upper Volta, Niger and Chad. Lack of water has parched the earth causing heavy livestock losses and vast areas of grazing land may be unusable for some years to come. Massive relief operations have been mounted by many nations and international organizations and hopefully the large stocks now

accumulated in central staging areas can be delivered to the villagers before they hoped for rains block off normal transportation routines. But even with these emergency measures, serious protein deficiencies in today's children may have sharp<sup>y</sup> adverse effects in future years.

## B. Previous History

The Regional Major Cereals Project continues a coordinated research and testing program that has been assisting West African countries to realize the potentials offered by the latest scientific advances in breeding techniques for high-yielding and protein-rich varieties of sorghum, millet, and maize.

This new project for the period FY-1970 - FY-1975 is both an intensification and expansion of the Major Cereals Regional Research project in Africa which had been funded during FY-1964 - FY-1968 under the development research activities of AID's "War on Hunger" office and the original 1963 FASA agreement AID/Res 20 between AID and the Agricultural Research Service of the U.S. Department of Agriculture, USDA/ARS. In FY-1969, the original project was split into two projects one for West Africa and one for East Africa, both funded by the Agricultural Division of the Bureau for Africa.

The major emphasis of the earlier major cereals project, FY64-68 was upon basic and adaptive crop research. Since the first phase research component produced results by developing and introducing new varieties of sorghum, millet and maize, the emphasis of the new project was upon further development and strengthening of the crop research capability of the cooperating research body in Nigeria, the Institute of Agricultural Research (IAR) at Ahmadu Bello University (ABU) in Samaru, and the Federal Department of Agricultural Research at Moor Plantation in Ibadan; expansion of field trials; and stimulation of adaptive research within the other participating countries. The research accomplishments of this project in the early years starting 1964 and the examples elsewhere of recent break-through in cereals production in Mexico, the Philippines, Vietnam, Turkey, India and Pakistan had strengthened the probabilities for similar dramatic break-throughs in West Africa.

In the past, many countries carried out independent crop research without adequate conditions and resources. Many of the research problems are similar and with each country trying to do the job alone, the result is costly and duplicated effort.

Another important emphasis of the new project was to further strengthen the Scientific Technical Research Commission (STRC) an agency of the Organization for African Unity. In carrying out the coordinating role in cereal crop research in West/Central Africa, STRC has been involved since 1963 when Major Cereals Research was officially accepted as a project of STRC at a meeting in Lagos of representatives of the cooperating or participating countries. The new project marked a special effort to increase African participation in the project, by the funding of an "effective" STRC Coordinator's Unit with an African as Coordinator. Before FY-1970, the head of the USDA/FASA team had been the Coordinator.

An additional element in the new project which had been seriously lacking in the earlier phase was the specific funding for participant

The technical assistance in research provided under the PASA agreement between AID and USDA signed 1967, included two USDA scientists specializing in sorghum breeding and plant pathology. A second plant pathologist was stationed at Moor Plantation in Ibadan in 1965 and an entomologist and soil scientist joined the staff at IAR, Samaru in 1966. Under the new project, the addition of three field trials officers (FTOs) was planned in FY-1971 and a seed production specialist shortly thereafter as explained in further details in Parts IV and VII of this report.

IV. Project Funding, Staffing, and Resources

The U. S. financial contribution is summarized below both for prior years FY'63 - FY'69 and FY'70 - FY'75 as projected until the anticipated termination of AID assistance at June 30, 1975.

TABLE 2  
AID Financial Contribution  
(\$000)

<u>TOTAL</u>	<u>TOTAL AID</u>
	<u>4,067</u>
A. FY'64 - FY'69 period	<u>1,222</u>
B. <u>FY'70 - FY'75 period (program estimate)</u>	<u>2,845</u>
1. <u>Technical Personnel Services</u>	
a) USDA/PASA Team	1,080
b) Field Trial Officers (FTOs)	540
2. Participant Training	223
3. Commodities	163
4. Other Costs	
a) Local expenses for PASA Team and participants	570
b) Support of STRC Coordinator's Unit	204
c) Other local expenses	65

At project start up in FY 1964, two USDA scientists specializing in sorghum breeding and/plant pathology were assigned to the headquarters station at IAR-ABU. A second plant pathologist was stationed at Moor Plantation in Ibadan in 1965 and an entomologist and soils scientist were added to the staff of IAR, Samaru in 1966. The USDA team increased to six in 1972 with the assignment at IAR-Samaru of the seed production specialist who also has now assumed duties of team leader. Previous team leader and USDA cereals breeder departed March 1973. The two positions temporarily vacant, the cereals breeder at Samaru and plant pathologist at Ibadan, are expected to be filled within a few months.

As seen in the table, the contribution to personnel services includes logistical support of the three Field Trial Officers, described further

AID commodity support for the USDA team includes vehicles, office furnishings and supplies, and laboratory supplies and equipment. As observed by this evaluation, the offices and laboratories of both PASA team and the staff of IAR are well organized and equipped and there have been no apparent problems or difficulties impeding the effective use of AID furnished supplies and equipment.

#### B. Nigerian Government

Nigeria acts as the host country, providing land, buildings and office space both at the Federal Department of Agricultural Research, Moor Plantation, Ibadan, one of the countries leading Nigerian research centers, the new IAR premises and the Institute of Agricultural Sciences at Ahmadu Bello University in Zaria which serves as the project headquarters.

IAR, is the main agricultural research facility in Northern Nigeria, is a legal entity separate from the university but it and the Faculty of the College of Agriculture have been coordinated into a unified working organization. The organization and operation of IAR/ARU are similar to these aspects of U.S. land-grant universities. The IAR organization for research and administration includes four departments: Plant Science, Soil Science, Animal Science and Agricultural Economics.

The six State Governments of Northern Nigeria provide the principal financial base for IAR which has received some external assistance from several sources other than USAID, as detailed below in Part III D.

#### C. STRC and Participating Countries

The STRC arm of OAU is important organization headquartered in Lagos which itself has regional offices in Africa as follows:

1. Inter-African Bureau for Soils and Rural Economy in Bangui (6 employees).
2. Inter-African Commission for phyto-Sanitation in Yaounde (13 employees).
3. Inter-Africa Commission for Animal Health and Livestock Production in Nairobi (20 employees).
4. Inter-African Bureau for Scientific and Technical Publications in Niamey (7 employees), and
5. Scientific, Technical and Research Commission in Lagos (38 employees, with 5 vacancies to be filled).

Of the \$3,8 million OAU budget for 1973, \$700,000 was earmarked for STRC in support of the above regional offices and the following joint projects under STRC/OAU sponsorship

- J.T. 155 Rinderpest Project Coordinated with U.S., British and German assistance.
- J.P. 26 Major Cereals Project with U.S., French and British assistance.
- J.P. 27 African Medicinal Plants, based Ifo University, Nigeria.
- J.P. 28 Bovine Picuro - Pneumonia Project.

While STRC has full support of the parent organization OAU because of present need for food crop production in participating countries and the urgent requirements for training scientists and technicians (e.g. 95% of West African research workers are expatriates), its budget is spread thinly over a large <sup>group</sup> of activities cited above. Therefore, AID is now providing funds for maintaining the Coordinator's Unit in STRC with its African chief serving in the key post of Project Coordinator.

STRC employs its regular staff for fulfilling its various projects: supervising or conducting field trials; training of local scientists; publishing reports on progress, findings and results; sponsoring seminars; assisting in the selection of training candidates, etc. Another staff member, supported by AID funds under the project, has been assigned to the STRC/Lagos office to assist the FASA Team in day-to-day dealings with Nigerian authorities, particularly in expediting release of project commodities from Customs, a function performed by USAID/Lagos before the project became independent of such logistical support. Under current project agreements, STRC undertakes to seek ways of contributing a larger share toward operations of the Coordinator's Unit.

Participating countries provide land and personnel for conducting field trials; offices for the respective Field Trials Offices headquarters; and land facilities, and staff for pilot seed multiplication operations at selected sites in Niger, Chad, Upper Volta and Nigeria.

#### D. Other Donor Assistance

Britain and France are defraying the basic salaries for the Field Trial Officers (FTOs) with AID covering household, transport and related allowances. Two French FTOs have been in the field since the fall of 1971 stationed at Dakar and Yaounde; one British FTO has been working almost a year in Kano and a second British FTO is expected shortly in Accra.

The project also benefitted from external assistance to LAR, valued at roughly \$400,000 for the period FY'61 - FY'66. The main sources were Rockefeller Institute which financed staff salaries, housing, equipment and work buildings for cereals research and the Ford Foundation which financed staff salaries, housing and equipment for rural economy research. Sizeable contributions were also made by the U.K. Freedom From Hunger Campaign for the new laboratory block at Mokwa and the U.K. Ministry for Overseas Development which contributed salary supplements and Nigerian training to support research projects. Two smaller contributions were made by UNICEF for equipment for aflatoxin research and Netherlands Technical Assistance for senior staff salary supplements.

V. PROJECT PURPOSE AND GOALS

A. General

The Major Cereals Project, as conceived in 1963 and initiated in 1964, encompassed both east and west Africa. The three major objectives were: (1) cooperation with research institutions in Nigeria, Uganda, and Kenya to enlarge and provide additional support to research programs designed to increase production of the major cereals in Africa; (2) to stimulate and sponsor cooperative research on all aspects of cereal crop production throughout the area; and (3) to provide in-service training at the best quarter stations, to individuals sponsored by their respective governments.

In FY 69, the Major Cereals Project was divided into an eastern and a western segment. Funding for the eastern region was shifted from AID/TCR to the Agriculture Division of the African Bureau. The latter Bureau also assumed responsibility for funding the western segment, effective July 1, 1969. Sixteen West African countries cooperate with this program.

The current basis for the Major Cereals Project of West Africa is provided by the Grant Agreement between USAID and the Scientific, Technical and Research Commission (STRC) of the OAU. The purpose of this grant is to assist the grantee, STRC, in the establishment and development of a coordinated research, testing and multiplication program for staple food grains and training of a cadre of agricultural research scientists in Central and West African States.

In its FY 1973 Project Appraisal Report or FAR, submitted by the AID RDO office at Niamey in compliance with prescribed AID/Washington project management procedures, the project purpose was stated as follows:

1. To strengthen the applied agricultural capabilities of 16 West African countries within a regional framework and systems established by the STRC/OAU.
2. To develop, disseminate, and multiply high-yielding, disease-resistant, protein - rich staple cereals varieties - corn, millet and sorghum.

The PAR also stipulated the program goal as follows:

To increase the quality and quantity of staple food crops available to the rapidly increasing population of West African having only limited natural resources.

In terms of the evaluation procedures for the preparation of the regular annual PAR for current on-going AID projects, the program or sector goal is the higher purpose or desired end toward which the main efforts of AID/<sup>OAU</sup>the cooperating countries are directed.

For use in PAR submissions in future years, a Logical Framework Matrix which summarizes the main project components and shows the relationship between project inputs, outputs, purpose and goal, is included in this evaluation report as Appendix B. The AID Project Manager, in consultation with other project officers, may wish to revise or modify this Logical Framework Matrix before preparation of the next PAR submission in FY 1974.

Under regular AID evaluation procedures, "outputs" are the major kinds of results that are expected from good management of project inputs or resources. In the discussions below "outputs" are generally referred to "objectives" in order to provide the evaluation team members with a convenient reference to a basic project document, the PASA agreement between AID and USDA/ARS, which lists the major activities undertaken as "objectives."

#### B. Major Project Components or "Outputs"

Under the Grant Agreement, AID finances three main components.

1. Technical services - supplied through an agreement with the U.S. Department of Agriculture.
2. Commodities - such as equipment for seed testing, multiplication, and research laboratory equipment.
3. Training of African participants.
4. Costs of a Project Coordinator's Unit in the STRC.
5. Support cost of Field Trial Officers (FTO)

In evaluating the Major Cereals Project, the team strongly feels it is now desirable to review the targets and objectives of each of the component parts of the project, namely PASA team, STRC and FTOs. It should be noted that targets and objectives for each component are distinct. The evaluation team found that the respective responsibilities have at times been confused and misunderstood.

With respect to technical services, the most recent Participating Agency Service Agreement available is dated December 23, 1971, and lists the following objectives for the USDA team:

1. Select and develop local and foreign germplasm for millet, sorghum, corn and pulse for high yield, high protein content, disease resistance, and adaptability to the different ecological zones of cooperating countries in West Africa.
2. Ascertain scientific, cultural and management techniques for millet, sorghum, corn and pulse crops with recommendations to be published for the extension services of cooperating countries.
3. Cooperate with existing research organizations and institutions of cooperating countries in applied and basic research on referenced crops, and to give assistance and guidance to their staff in their work on these crops.
4. Conduct field trials of selected and developed high yielding millet, corn, sorghum and pulse crops in the different ecological zones of cooperating countries.
5. Start a seed multiplication program of developed and selected adapted high yielding, protein rich, disease resistant varieties acceptable to local consumers and approved for consumer acceptance by cooperating countries.
6. Strengthen research institutions and organizations by selecting participants for training in the U.S. and Canada and providing them short term in-service training at Senegal and Mali.

7. Each PASA member technician shall have one or more local counterparts, if possible, in his respective speciality to strengthen the institutional building element of the program for program continuity after PASA phaseout.

With respect to the Project Coordinator's unit in STRC, the grant document states "The coordinator is responsible for liaison between the PASA team, the research stations and the participating states and will coordinate the recruitment and selection of African scientists to be trained and assist in the preparation of conferences. He will also be responsible for the coordination of field trial and seed multiplication activities and their coordination with local research and extension organization in the states."

The major activities expected of STRC in assuming the responsibility for the overall coordination of the program are listed in the grant agreement as follows:

1. The provision of a competent African scientist to act as the coordinator of this project.
2. The facilitation of the entry and travel of the AID technicians among and within the participating and other interested states in the performance of their duties and the accordance of the privileges and immunities normally granted to U.S. Embassy personnel of comparable rank and status.
3. The dissemination of information of the progress to its members on a regular basis through the Soils Bureau Bulletin, publications issued by the Grantee, and other means such as the extension services of each participating state.
4. The sponsoring of seminars in cooperation with AID and the PASA team to discuss the progress of this project and other activities in related fields. The Grantee will assist in financing delegates to these seminars from the coordinator's unit fund provided under this agreement.
5. The recruitment and selection of scientists for training under this program.
6. The encouragement of its member countries to carry out adaptive research, field testing, training of personnel and to improve their scientific and administrative capabilities in this area.
7. The encouragement of member states in a seed multiplication program of certified seeds.

The Field Trial Officers, who report to the Project Coordinator, STRC, are assigned the following principal responsibilities:

1. The establishment of regional trials, within assigned areas, for millet, sorghum, maize and pulses.
  - (a) Trials of varieties and experimental lines best adapted to the region concerned.
  - (b) Trials of cultural practices such as plant density, and time of planting
  - (c) Trials of quantity and type of fertilizers needed for optimum yields.

2. The assembly of data from experimental plantings and the preparation of periodic reports in both English and French. (These reports should be submitted to the Project Coordinator, STHC, for distribution to participating governments and agencies.)

Secondary responsibilities of the Field Trial Officers are:

1. To assist in any way possible in the development and improvement of organization, procedures and facilities for the production and distribution of improved and adapted seeds.
2. To assist local research and extension staff in the development of effective procedures for the dissemination of research findings and the adoption of new agricultural practices by farmers.

## VI. PROGRESS ACHIEVED

The goals and objectives of the West Africa Major Cereals Project are listed in a previous section. To permit an effective evaluation of the rate of progress, the team attempted to examine individually the "outputs" or "results" expected from the several components of the project. The progress of the technical services component will be discussed first.

### A. USDA/PASA Technical Services

At the outset two general observations are essential. (a) Although a number of the listed objectives were not activated or pursued in addition to the Major Cereals crops, the team was informed that the plans to initiate such research were never activated or funded. Evaluation therefore, will be confined to research with sorghum, millet and maize. (b) The research program of the USDA "PASA team" is so closely cooperative and integrated with that of host organizations, namely, the Institute for Agricultural Research, Ibadan, the Federal Department of Agricultural Research, Ibadan, that it would be impractical, if not impossible, to evaluate accomplishments only of the PASA personnel. As illustration, within the area of plant breeding, the PASA project breeders in recent years have been more involved with maize than sorghum or millet. This has been due largely to the fact that IAR has had breeders specifically working on sorghum and millet and none working on maize. Sorghum and millet breeding programs at IAR, however, have received both financial, commodity and advisory support from the project. The project maize breeding program at Samaru has been conducted in close cooperation with the IAR program at Mokwa, and the Western State, Federal, IITA and JP-26 breeding programs in Ibadan.

The development of improved varieties of the major cereals concerned, the first cited objective of the technical services, has progressed reasonably well, with notable new breeding and developments in maize; significant but slow progress in sorghum; and comparatively less progress in millet.

In sorghum, breeders have identified shorter, earlier, insensitive to photoperiod hybrid varieties that give 2 to 3 fold increases in yield in the Sudan zone when grown with the recommended cultural practices. The highest yielding varieties presently available are unacceptable in seed color and texture, but the breeding of varieties with similar yields and acceptable quality has now been completed. Although the short, early varieties have been found to also increase production in the Guinea-Savanna zone, the relatively longer rainy season there makes their production impractical.

If planted at the beginning of the rains they mature before the end of the rainy season and seed quality deteriorates rapidly. If planted midway during the rainy season, there is danger that insects and diseases and leaching of nitrogen will drastically limit yields. Local tall varieties improved through selection have been developed and released for both the Northern Guinea zone and the Southern Guinea and Riverain areas. Several varieties adapted to the Northern Guinea zone have been developed and are being subjected to final tests.

The millet breeding program centered at Kano, which has recently graduated into a large program, is presently not as advanced as the sorghum program. Lapses in staff assignments were contributing factors. Nevertheless one variety (Ex Bornu) was released which yields significantly above farmers' varieties. Varieties with major yield increases cannot be expected for two years. The team was well impressed by the millet improvement program conducted at Bambey, Senegal by IRAT in which they are attempting to restructure the millet plant and thereby increase the grain/straw ratio. Different improved millet varieties are being simultaneously developed for the main ecological zones within the country.

The discovery of a number of high yielding early maturing maize composites in the Northern Guinea zone than was formerly expected probably offers the greatest opportunity for a major increase in grain production in West Africa. Composites and hybrids have been developed which when planted at the right time with proper fertilization, and weed and pest control have given yields as high as 8,500 lbs/acre in experimental trials, and 4,500 lbs/acre in farmer fields when fertilizers and other improved management practices were used. Three new composites, one white and one yellow seeded hybrid will be ready for release in 1974. Maize has a greater potential for responding to improved management practices and fertilizer than does sorghum. Further, short season maize which matures before the end of the rains suffers less deterioration in the field through bird damage than does short season sorghum.

The PASA team maize research conducted in cooperation with the Federal Department of Agricultural Research at Moor Plantation and USAID/Nigeria maize breeder at Western State has made significant contributions. A variety having increased root strength was developed; also two genetically broad based composites carrying genetic resistance to two serious diseases, rust and blight. These composites now form the basis of the maize improvement program conducted by IITA, Ibadan.

Research on genetic resistance of sorghum to diseases is also yielding results. From some 4,000 lines first screened in 1970, for susceptibility to Striga, about 150 have continued to show resistance. Incorporation of this resistance into the West Africa Bulk composite has been initiated with the intent of developing a striga resistant composite.

The reactions of over 3,000 sorghum lines from the world sorghum collection to a number of diseases has been determined since initiation of the project. In addition to striga resistance, resistance to leaf diseases, such as sooty stripe and grey leaf spot has been found and is being bred into new varieties. A determined effort is being made to find resistance to head mold, a disease particularly severe when sorghum matures under wet and humid conditions. Seed of the better lines has been sent to Senegal. Resistance has also been found for covered smut, loose smut, and head smut.

High types of resistance to downy mildew, smut and ergot have been found among several thousand millet lines which were screened for reaction to these diseases. Seed of resistant lines has been sent to Senegal Niger and Chad for further testing this year. These lines are being evaluated for yield in Northern Nigeria and selected lines will be composited to form a new disease-resistant early maturing variety next year.

Resistance to insect attack also has been found in sorghum. Primary and recovery resistance to the major species of shoot fly have been isolated and are currently being established in the breeding program. Although high types of genetic resistance to stem borers and the sorghum midge have not yet been found, safe chemical control methods have been developed for one species of borer and the midge.

With respect to the second objective, development of cultural and management techniques, some degree of progress can be reported. With respect to fertilization, production of high yields in the Sahelian zone requires application of 100 to 150 kg/ha of nitrogen fertilizer. As phosphorus is not readily fixed by soils of the savanna ecological zone, relatively low rates of phosphate fertilizer are required. With intensive cropping for several years it has been established that potassium and zinc become limiting factors for cereal production and must be supplied.

With respect to method of planting and tillage, flat cultivation has been determined to require less labor and results in less erosion than ridge cultivation. Whereas plant populations of early, short season types of sorghum and millet must be increased for optimum yields, the long season, tillering varieties compensate for differences in stand and give little benefit from increased plant density.

Date of planting studies of cereals show pronounced reduction in yield as planting is delayed after the rains have started. This effect has been established to result from heavy leaching of nitrogen prior to the critical flowering and grain formation periods of the plant following delayed planting.

Although considerable information has been accumulated from research on soil and management practices, the team was not assured that this information in proper form had been widely and systematically made available to extension services of all cooperating countries. (See recommendations).

Relative to the third objective, cooperation with existing research organizations, significant progress was noted. In fact, if the evaluating team were to select the most outstanding accomplishment of the PASA group it could readily be the stimulation and improvement in communication between cereal research personnel in West Africa. Of particular significance is the removal of the communication barrier between the Francophone and Anglophone countries. The exchange of germplasm with special genetic attributes is a second accomplishment. Numerous instances were noted of distribution of types resistant to insects and diseases, of types with special morphological characters such as dwarfness and of types carrying genetic or cytoplasmic sterility and early maturity.

Still another but less obvious type of cooperation and assistance was noted. The recent more effective system of plant breeding used extensively throughout West Africa was ushered in by project breeders. It consists of the development and improvement of two broad based composites through recurrent selection. After each cycle of improvement a commercial hybrid variety can be produced. In areas where hybrid production is not yet feasible, the parental composite varieties can be grown for use as parental

The system thereby provides maximum flexibility. It also permits continual improvement of the composites, as well as of the hybrids between the composites for many cycles. The development and dissemination of information regarding this effective and flexible breeding system has greatly improved and hastened the development of superior varieties of cereals in West Africa.

The fourth objective, relating to the conduct of field trials, has been met to some extent. Regional variety trials were conducted during the past 2 years as follows:

<u>Regional Trials</u>	<u>1971</u>		<u>1972</u>	
	<u>No. Locations</u>	<u>No. Varieties</u>	<u>No. Locations</u>	<u>No. Varieties</u>
Sudan Savanna Sorghum	8	11	7	10
Guinea " "	6	13	5	8
Millet	7	6	5	8
Maize	9	8	7	11

These regional trials permit the research workers of various research institutes to see other potentially good varieties grown in comparison with their own. They also show the adaptation of the varieties within different zones. Unfortunately however, the data on yields often do not clearly portray the potential productivity of the varieties under test. Lack of uniformity in soils and distribution of available moisture supply often lower precision. Of still greater importance is differential damage to sorghum and millet by birds. The relatively small plots are particularly vulnerable to severe destruction even by light concentrations of birds. When maturity of varieties coincides with bird migration, complete destruction may result. At times bagging of heads may be a useful means of determining yield potential. As the field trial officers become more experienced and better equipped logistically and more FTO's added perhaps it is hoped they can observe the regional trials more frequently and thereby assist in increasing the validity of data collected thereon.

The fifth objective, that of starting a seed multiplication program, was initiated only in October 1972. Seed production studies were planned at 5 sites during the 1972-73 dry season but results are not yet available. The objectives of the program are:

1. To increase breeders seed supply of sorghum and maize varieties, sorghum steriles and restorer lines.
2. To obtain seed production data pertaining to blooming time, pollen shed, reaction to photoperiod, temperature and relative yields during a part of the dry season.
3. To produce, test and demonstration plot quantities of hybrid seed of sorghum and maize.
4. To locate and help develop interested seed producers.

Although the dry season would seem to pose certain advantages for seed production such as low incidence of diseases, insects, and contaminating pollen and higher seed quality, seed production during the rainy season will also be studied. This period will be of

... production of photoperiod sensitive varieties. After effective seed production systems have been developed there remains the problem of developing or improving seed production organizations within the countries. This problem is particularly acute because of the lack of any indigenous or local seed companies who can take advantage of the recent developments for a quick take off.

With respect to the 6th objective, that of providing participants with training in the U.S. and Canada and in-service training at Samaru and Ibadan, funds became available for overseas training only in 1970, Eight Nigerians are now working with the project at Samaru each of whom has had some overseas training (some funded by organizations other than USAID). Five of these are doing thesis research for or already have completed the M.S. and 3 received "no-degree" training. Only one non-Nigerian, from N. Cameroun, has received in-service training at Samaru. The major obstacles to providing in-service training to non-Nigerians are (1) lack of housing at Samaru, and (2) language barrier of trainees from Francophone countries. Unless a solution to these obstacles is realized, this objective cannot be attained for non-Nigerians.

#### B. Participant Training Program

The Program Manager is convinced that training is of prime importance as a component of this project. The evaluation team concurs in this conviction and regrets that formal training could not have been initiated at an earlier date. The Program Manager has vigorously pursued the training aspects and is personally interviewing the candidates. He informed the team he has 53 applicants and hopes to fund approximately 30 in 1973.

The team is convinced that the seventh objective, which stipulates that each PASA technician have one or more local counterparts, is of prime importance. Presently the members work closely with staff members of IAR. A number of these staff positions are held by British scientists and supported by Britain's Overseas Development Administration. The team was told that ODA is reducing its support and many of these staff members will be lost to IAR. This prospect makes the training of Nigerians a particularly critical issue. On the scheduled termination date of the PASA, June 30, 1973, not only will there be a limited number of Nigerians trained, but they will be woefully lacking in experience.

#### C. STRC Coordination Unit

STRC, as spelled out in the grant document, was envisaged to serve an extremely important role in the coordination of the overall Major Cereals Project. A special coordinator's unit was established to service the project. A number of responsibilities assigned to the coordinator have been conducted in an effective manner. The team learned that STRC had (1) cooperated in sponsoring seminars; (2) translated and distributed reports of seminars in 1965, 1967 (not held but written report prepared), 1969 and 1971 (in process); (3) cooperated with the project manager in recruiting and selecting trainees in member countries outside of Nigeria; and (4) facilitated inter-country travel by AID and USDA personnel through assistance in obtaining visas and related problems. However, a number of other important functions have not as yet been undertaken. These include dissemination of information on research progress to and among member countries, encouragement of member countries to carry on adaptive research, field testing and seed multiplication, and coordination of field

trials and seed multiplication activities with local research and extension organizations. In fact, there has been little contact on technical or operational matters between the STRC coordinator's unit and the Field Trial Officers or the PASA team. The evaluation team believes that strengthening of the coordinator's unit is of great importance to the success of the project. STRC must, in fact, shoulder the responsibility for all aspects of the regional coordination of the research, development, and educational phases. There is no alternative coordinating body. The need for strong coordination by STRC will be accentuated when the PASA terminates in June 1975.

D. Field Trial Officers

The evaluation team believes that the Field Trial Officers could and should become a strong outreach of the STRC coordinator's unit. Presently their activities are limited to trials of promising cereal varieties. In some cases the region they serve is too large to permit the required activities and observations in all countries. In the interest of increasing their effectiveness their activities should be expanded to include (1) field trials of management practices, such as plant density, pest control and cultural methods as well as variety trials, (2) strengthened contacts with counterparts in each country to facilitate conduct of tests, (3) strengthened liaison with extension services within the countries to provide a mechanism of transmittal of research findings to the farmers, and (4) greater involvement in assisting countries to multiply seed of improved and adapted varieties

E. Need For Multi-Discipline Effort

Certain questions have been asked regarding the composition and specific operations of the PASA team. Are the disciplines represented in the team appropriate; should any be eliminated or added? The team feels that with the replacement of the breeder at Samaru, that team will be of proper balance as related to cereal research of the team and IAR. The development of superior varieties and hybrids must be of a continuing nature to cope with biological changes in pests, environment, etc. A full complement of relevant disciplines is required for such development. As illustration, changing the structure of the sorghum plant in the Sudan to short types requires research on plant density (short types will not compensate for gaps in stand), on weed control (less shading stimulates weeds), on disease and pest control (the dense, short stand alters the micro-environment among the plants and may favor build-up of diseases and insects), on fertilizers (denser plant populations may require more fertilizer), etc. It is readily apparent that elimination of any of the disciplines would lower effectiveness. It is also obvious that a coordinated and integrated team effort is highly necessary.

Should research be shifted from "basic" to "applied" research? The team believes that this type of delineation is not meaningful. All of the research conducted is "problem oriented" whether it requires a sophisticated technique or whether routine operations are adequate. So long as the research findings are useful in attaining a necessary objective, they are entirely appropriate.

## VII. ORGANIZATION, MANAGEMENT, AND TRAINING.

### A. Scientific

One of the two principal purposes of this project is to "to strengthen the applied research capability of 16 West African countries within a regional framework and the systems organized by STRC/OAU". An important function or "output" of this J.P.-26 Project, through the coordinated efforts of USDA/PASA, STRC staff and Field Trials Officers, is the stimulation of food crop research in Africa.

In the interest of encouraging and sponsoring cooperative research, the PASA team of scientists endeavored to supplement and strengthen on-going research activities. Therefore, operational procedures were designed to encourage and develop local cooperation to the maximum degree possible and in this context to establish new research activities in those subject matter areas which had in the past been receiving limited research emphasis.

At this point, very good relationships appear to exist between the PASA team and IAR. Similar to the manner in which IAR as a legal entity separate from ABU has been coordinated into a unified functioning organization, the PASA Team members are integrated into structure of both the two Nigerian bodies; they attend committee meetings, deliver occasional lectures, supervise selected theses research and preparations and serve as senior staff advisors. This high degree of multi-discipline cooperation and complementarity has been mutually advantageous for both J.P.-26 and IAR. It is through the PASA Team of J.P.-26 that IAR has initiated contacts with various national and regional research bodies in the area.

### B. Project Management

As noted previously, J.P.-26 under the basic agreement between AID and STRC/OAU is a regional, multi-donor project involving 16 participating African countries and the management relationships are correspondingly complicated.

#### 1. AID

AID supervises the project through its Project Manager at the Regional Development Office in Niamey, Niger which is responsible for the Bureau for Africa's field operations, mainly in the five Francophone countries of the Entente Council. Considering the logistical difficulties, the AID Project Manager has maintained close contact with all project elements, and has travelled extensively among cooperating countries, often accompanying the STRC Project Coordinator in the development and implementation of the participant training programs in these respective countries. However, communications, transport and travel connections between Niamey, Lagos, and Sararu are extremely cumbersome and time-consuming and so the decision was reached to transfer the Project Manager's duty station to Lagos at the end of June, 1973.

The evaluation team welcomes this transfer and believes it will support and strengthen STRC's role in the project and immensely improve coordination between STRC, PASA Team, FTOs and cooperating countries.

The evaluation team has observed that USAID Missions and Offices in the area, primarily because of the current AID emphasis on food crop production, are interested and generally aware of project developments, particularly where FTOs are stationed as in Senegal, Nigeria, and Cameroon. Use of USAID mail and distribution systems has on occasion been very useful in the transfer of test seeds and other project materials.

## 2. STRC/OAU

Under the current phase of J.P.-26, i.e. the period FY-70-75, special importance is accorded STRC's role in coordinating cereals research in West Africa. A specific Coordinator's Unit has been established at STRC, Lagos, to perform the Project Coordinator's function previously performed by the USAID/PASA team leader at Samaru. As detailed in Part VI, a number of important responsibilities have been effectively performed but certain important functions have not as yet been undertaken by this Coordinator's Unit.

As shown in Part IV, STRC/OAU is a fairly large African organization with regional offices in five countries including the headquarters at Lagos and is currently sponsoring five major projects in addition to other on-going activities. The Project Coordinator for J.P.-26 also serves as STRC/OAU Assistant Executive Secretary with widespread duties and therefore is able only to devote limited time to J.P.-26. In fact, there is only one full time employee in the office for J.P.-26, the Shipping Manager, who provides essential support to the USDA/PASA Team in clearing deliveries through Customs, registering vehicles, handling correspondence and other dealings with USAID, and Nigerian Government, and providing various similar services.

In view of this situation, the evaluation team makes the following recommendation which it regards as one of the more significant ones, particularly in view of the need for a much more active STRC coordinating role when AID assistance terminates in FY 1975: A bi-lingual agronomist or other trained agricultural specialist should be added to the staff of the STRC Coordinator's Unit as soon as possible to coordinate at the technical and operational levels the activities of PASA, FTOs and project seed multiplication centers. In this capacity, he would be in contact with participating country Director's of Agriculture and related technical personnel of both national and regional organizations. He might also serve as the Secretary for the Executive Committee on Research and Training discussed below.

This proposal has been discussed with the STRC Project Coordinator who supports it and feels OAU headquarters may be able to make a budget allocation for this STRC post.

## 3. Field Trials Officers (FTOs)

The technical and financial aspects of the Field Trials Officer operations are detailed in Parts IV and VI of this report.

The evaluation team is impressed with the technical competence, broad agricultural interests, and industry of the FTOs and believes they have made an important contribution to project progress, through frequent personal visits, distribution of bi-lingual reports and documents and materials, and expediting the transmission of test seeds and supplies. These FTO activities have re-inforced and extended the contacts earlier initiated by J.P.-26 with the national and regional organizations. Over the next two years, the FTOs should develop effective liaison with the seed testing, seed multiplication, and extension services of the respective countries.

There was also some concern expressed by the team of close contact with the STIC Coordinator's Unit. Also, there was some concern expressed because there appeared to be variance in the responsibilities undertaken by the respective FTOs so that they do not uniformly or consistently conform to the operational work guidelines as established by STIC, copies of which were made available to the evaluation team by AID/W. Since local circumstances vary greatly within the countries of West Africa, the evaluation team did not see this as a serious problem. Nevertheless, the team recommends that one of the first tasks of the STIC Agronomist, when appointed, should be to consult with FTOs, review their operations, and where actually necessary, revise or modify the "Operational Work Guidelines."

It was quite clear to the team that some of the FTOs are expected to cover too wide a geographic area, especially the FTO stationed in Senegal who is currently responsible for Gambia and eight Francophone countries. The team therefore recommends that STIC discuss with PAC, the French Government AID administration, the possible addition of at least one but preferably two bi-lingual FTOs. If and when this materializes, the STIC Project Coordinator should consider modifications in the country assignments of the FTOs so that each FTO station would be in a region geographically homogeneous and most effectively managed in terms of travel convenience, logistical arrangements and related management considerations.

In this context, a serious effort should be initiated to have each participating country designate, as soon as practical but during FY 1975 at the latest, a trained technician to serve as its Field Trials Officer in connection to the continued of J.P.-26 regional field trials and related project operations. This matter should be one of the key agenda items for the J.P.-26 Conference on Research Needs for Increased Cereal Crop Production. The requirements for country FTOs should also be carefully taken account of in the further planning of the participant training program.

During this study, the evaluation team had available only fragmentary information on the distribution of developed and released seed varieties or the extent to which farmers are aware of and use both newly developed and/<sup>improved</sup> local cereal varieties. We therefore, suggest that for the FY 1974 PAR exercise FTOs, with the help of the other project officers and LAR, should collect and summarize statistical data that could usefully serve as quantitative indicators of progress for the PAR submission.

#### 4. USDA/PASA Team

Since the withdrawal of support from the USAID office in Zaria, the PASA Team encountered logistical support problems. There is an urgent need for this support to avoid an inordinate diversion of PASA working time on such logistical matters as supervision of vehicle operation and repair, travel arrangements and meetings plans and visitors at distant airports (e.g. Kano), communications with STRC, USAID, FTOs and seed multiplication centers, etc. In view of the importance of seed industry development and the need therefore for expanded PASA Team visits and contacts with regional research projects, institutions, and field stations, the evaluation team believes the administrative burden should be minimized as far as possible and that it is recommended the addition to the staff of an administrative assistant who need not necessarily be an American but might be supplied locally under contract or other arrangement deemed feasible by AID and STRC.

In its review of project operations, the team noted fairly clear awareness and understanding of project objectives on the part of STRC and the cooperating country representatives contacted but questions did arise in discussions with the PASA Team, mainly in relation to the seed production program. The USDA/ARS job description for the Seed Production Specialist covers a large assignment including research on seed production, storage, distribution and maintenance of breeder seed; liaison with seed distribution agencies; expansion of demonstration plantings and regional trials; and the provision of guidance and counsel on all matters pertaining to seed production and distribution problems. In this connection, the evaluation team was aware of a USAID suggestion that the PASA Team monitor the seed multiplication program in order to strengthen it. However, the evaluation team, recognizing that further discussion between USDA/ARS and AID might be needed on this point, suggests that the PASA involvement on stations outside Nigeria continue to be limited to advice, cooperation, close contact, guidance, and counsel but that coordination should be the responsibility of the STRC Coordinator's Unit working through its anticipated Agricultural Specialist and the FTOs, and that actual monitoring per se might more appropriately be a function of the AID Project Manager. The PASA Seed Specialist should, of course, be able to provide AID Project Manager and FTOs any required technical advice and expertise for these purposes.

With regard to other implications of AID "monitoring", suggest that the annual PAR review may be a suitable mechanism for reaching better understanding of overall project purposes and goals. PAR worksheets for U.S. Action Agents might be useful for reviewing performance of both PASA Team and FTOs. Since FTOs are under the direct supervision of STRC, the STRC Project Coordinator, or his designee, might be asked either to participate in the review or to submit a separate evaluation of FTOs in writing, perhaps both if circumstances permit. Even before another PAR review is scheduled, it might be useful to prepare a revised or modified Logical Framework Matrix, using any observations of this report which may be pertinent.

C. Participant Training Program

One of the most important objectives of the Major Cereals in West Africa (OAU/STRC J.P. 26) Project was the provision for in-service training at the headquarters station at Samaru and in Universities in the United States and Europe of individuals sponsored by the respective governments of the 16 participating countries. This training was aimed at facilitating the Africanization of the project staff by the training of counterpart personnel who would continue to work on the project after the PASA team have left in 1975. Consequently, funds were made available for training in FY 1970 for participants of the cooperating countries. For Nigeria, the arrangements concluded with Ahmadu Bello University envisaged the following conditions:

1. The University would have a voice in the selection of the candidate and in the course of study to be followed.
2. The candidate would spend some time as a technician to determine whether he has a real interest in research and to establish his acceptability to the research supervisor.
3. Following (1) and (2) the candidate would enroll at some U.S. or European University for a period of 12-18 months in a prescribed course of study. Following this he would return to the sponsoring research institution for the conduct of thesis research. This would ensure that thesis research has some relevance to the agricultural needs of the area.
4. The degree would be granted by the participating African University.
5. Upon completion of the degree it would be expected that the individual would remain in the research program of the country for some specified period.

The areas of specialization to be covered in the in-service participant training program are related to the areas of priority in the J.P-26 Project, namely plant breeding, entomology, soil science and plant pathology. It was intended that when the project was fully operational all the PASA technical specialists would have students working with them as counterparts. This has been accomplished on a limited basis as seen in the table below.

Currently, AID Project Manager is responsible for making all necessary arrangements for the selection, interviewing, preparation of training specifications and locations of universities for selected candidates. He asks the PASA team for nomination of candidates.

Table 3

Counterpart Training

The current training program associated with the work of the PASA team at IAR and Ahmadu Bello University involves seven trainees as follows:

<u>Trainee</u>	<u>Discipline</u>	<u>Date of Return</u>
Adedewa	Plant Breeding (Maize)	July 1971
Adeniyi	Plant Breeding (Maize)	August 1972
Adeoye	Soil Science	June 1973
Adesiyun	Entomology	June 1972
Manzo	Plant Pathology	April 1972
Sako	Plant Breeding	June 1972

According to the AID Project Manager 20 trainees from participating countries have been already processed for training at various U.S. Universities. Another 53 candidates are now under consideration of which about 30 are likely to be finally selected in FY 1973 for training in the four priority areas indicated above.

### Training Outlook

The training that has taken place at Ahmadu Bello University Inc. with the exception of one student from Cameroon, involved only candidates from the host country, Nigeria. Even in these cases, training has been so short that counterpart status had been achieved for none of the position through 1969. No students from the Francophone countries has received training at Samaru and the proposed dormitory for housing and feeding of non-Nigerian students was not built nor were facilities provided for training in the French language.

It can be justifiably concluded that despite the progress that has been made not enough specialists from the various participating countries would be trained to take over the work of the PASA team on the termination of the present contract in 1975. Even if all the students now being trained complete their training by that date not all the disciplines would be covered in most of the participating countries for relevant ecological zones.

A serious concern about the training scheme is the fact that although it is expected that those trained under the project will work in it for a specified period, the few numbers of people involved and the shortage of staff in the participating countries would result in rapid loss of most of the technicians who are very likely to take up important administrative positions in the Ministries of Agriculture in the respective countries. It is surprising that even in countries such as Nigeria, it has been found difficult to recruit enough candidates for training.

### Suggestions For Improvement

1. The proposed Executive Committee for Research and Training should provide STRC advice and guidance on training policies and criteria, taking account of the varying situations among cooperating countries.
2. The PASA Team and IAR should further explore with IITA and IRAT the possibilities for short term training courses in French and English for national field trials offices and related participating country technical and research personnel.

## II. FUTURE PROSPECTS

As seen in Part VII., J.P.-26 has already developed high yield new corn varieties and by FY 1975 should be in position to release high-yield varieties of acceptable quality for millet, and for sorghum, both long and short season for the Guinea and Sudan savanna zones. Together with these new varieties, J.P.-26 should also be in good position, in cooperation of other research group, e.g. IITA, IAR and IRAT, to disseminate for extension specialists and farmers, an integrated package of crop production practices for each cereal.

According to latest available information, the replacement cereals breeders for both IAR and the IASA Team, each having training and experience in both cereals although concentrating on sorghum and corn respectively, will be arriving at Samaru shortly. For the next two years, the IAR/USAID staff will constitute a complete and well-balanced inter-disciplinary group. At the scheduled departure of the USDA Team in FY 1975, IAR will still have a solid plant breeding staff and the loss of departing U.S. scientists in entomology, pathology and soils science could be offset to a degree by the Nigerian counterpart staff, however young and inexperienced, provided there is no significant attrition due to further study or transfer. If additional suitable candidates were available and processed quickly in the priority participant training fields including perhaps seed technology, any remaining gaps in IAR staff would be correspondingly less serious.

In this situation, the role of STRC still remains crucial. Although the broad research program at IAR could continue at only a slightly diminished level, IAR's responsibilities under its charter are limited to Northern Nigeria. STRC, which has been expected to provide the regional framework, still appears to be the most appropriate body but only if a small but full-time cadre of three officers is established in the STRC Lagos office, capable of providing necessary technical coordination and management. The establishment of the Executive Committee for Research and Training and the individual country FTOs will re-enforce the regional framework but a strong STRC commitment to leadership is the key factor for assuring continuation of the regional seed trials, dissemination of research results, and seminars. Under the FY 1972 Grant Agreement, STRC undertook to hire three agricultural researchers, one in FY 1973 and two before the end of FY 1975. The extent to which STRC can organize such a cadre of similar technical and management personnel will measure the success of J.P.-26 in institutionalizing regional cereals research in West Africa. It seems quite evident that solid national or sectional research programs will continue in several places, including IRAT/Bambey, IAR, Moor Plantation, and of course research for tropical Africa at IITA, Ibadan.

The evaluation team was aware that ICRISAT, the newly established international institute at Hyderabad, India for research on the main crops in the semi-arid tropics-sorghum, millet, chickpeas, pigeonpeas - is exploring possible cooperative working relationships with several outreach or "satellite" stations in Africa, such as IAR, Samaru and Bambey, Senegal. ICRISAT is familiar with J.P.-26 and its regional connections but its relations with the so-called "outreach" stations are likely to be largely of bi-lateral nature with the national or sectional (IAR) institutions concerned. A possible ICRISAT input at IAR (this is of course a matter of negotiation between the parties directly involved) would naturally strengthen the research programs there, for sorghum and millet, particularly after 1975. Even in that event, however, STRC would need to continue its coordinating role, if the regional character of the research programs is to be maintained.

In discussions with officials in Upper Volta and Chad on plans and prospects for seed multiplication and production, the evaluation team gained insights into the constraints on participating countries in the Sahel group in the use and exploitation of project research outputs for staple food crops, sorghum and millet, compared to commercial type crops, e.g. wheat, rice. These not unfamiliar constraints include subsistence character of production; poor bargaining position of cultivators vis-a-vis traders; lack of markets, storage, credit, transportation and foreign exchange for the purchase of inputs; inadequate extension services and other infrastructure; tight national budgets, etc. Clearly these are formidable obstacles. Several countries have made various attempts to confront these problems thru price stabilization programs, but with limited success. The general trend is the curbing of government intervention in the normal trade and market structure with rather disappointing results thus far.

AID has organized both studies and projects to deal directly with staple food crop production and marketing aspects. Since the difficulties of achieving short run increase in staple food crop yields or productivity were emphasized so forcefully, the evaluation team wishes to take note of the limitations that must be faced in the early exploitation of J.F.-26 research results in the countries cited. It should also be recognized that even where economic prospects are generally more promising e.g. Nigeria, markets, credit and related infrastructure must be further developed, if the project's research results in seed production and multiplication are to be usefully exploited.

In the context of this economic situation, the application of current policies on staple food crops in countries of the eastern Sahel leads to priority emphasis on the improvement by selection of local sorghum and millet varieties widely known and therefore acceptable to both consumers and cultivators. Even with limited cash expenditures for fertilizer, pesticides or insecticides, these local varieties still have the potential of acceptable yield increases over existing or traditional unimproved varieties. Government officials indicated that development, field trials and consumer testing of new varieties including dwarf and short season will continue. Cultivator and consumer acceptance of newer varieties will be encouraged by convincing demonstrations that new varieties together with the package of crop practices can yield results of 3,000 to 4,000 kg/ha, or perhaps 50 to 100% above current figures for the best improved local varieties available. When adequate quantities of fertilizer and other necessary inputs are available, a workable basis may be found for introducing newer varieties, particularly if the higher productivity on staple food crops could permit a diversion of acreage and resources to the additional production of commercial-type crops such as cotton, groundnuts, etc. Furthermore, government officials are studying possibilities of multiplication and production of new seed varieties for possible storage against future crop shortages arising from drought, floods, or other adverse circumstances similar to the present emergency.

APPENDIX A

CRITERIA FOR EVALUATION TEAM

MAJOR CEREALS PROJECT (J.P.26)

The evaluation team is to address two phases of the project:  
Phase One (FY 1963 - 1970) dealing with staple food crop research and stimulation of regional and national agricultural research in West Africa;  
Phase Two (FY 1971 - 1975) dealing with efforts to train indigenous agricultural research scientists and insuring project continuity after planned American and foreign technical assistance phase out in FY 75.

1. Identification of project research contribution to IRAT, IAR, IITA and local research organizations in general, and technical information, as well as the following:
  - a. New varieties developed and released by project.
  - b. Development of scientific information relevant to soil science, entomology and plant pathology in relation to staple food crops.
  - c. Regional conferences, visits and meetings of scientists sponsored by project and research impetus created therein.
2. What use has been made by local governments, research organizations and institutions of project research outputs?
3. What is the role of STRC/OAU as sponsoring agency for the exploitation of project research results by the cooperating ministries of agriculture, and what is the relationship between STRC/OAU and these ministries?
  - a. To what extent has the project contributed to the staple food crop research needs of cooperating governments, and what constraints, if any, have impeded that process?
  - b. What impediments, if any, have confronted project contribution to the research needs of cooperating governments?
4. What technical training level is required for the implementation of an effective individual and regional cereals research program? Most PASA technicians provided by USDA hold Ph. D degrees. Is that same level of training required by Africans before Africanizing the project? What additional individual training is required to make effective Africanization of the project at the national and regional levels by the phaseout date in FY 75? Is training clearly related to project objectives?
5. Have the PASA team project staff been sufficiently oriented toward meeting future needs of extension and production programs of cooperating countries?
6. Have the PASA staff (Washington and field) kept up-to-date with AID project policy concepts in the implementation of project objectives?
7. Should PASA team contacts and communications be with cooperating ministries of agriculture, their departments of research, or be confined to regional research organizations in West Africa?
8. Are project objectives clearly defined and understood by STRC, USDA/ARS and ministries of agriculture of cooperating governments?
9. What measures have been taken by AID and STRC to institutionalize cereal research in West Africa, on a regional basis, and what financial support has been provided?

10. Did the research performed by the PASA team make a substantial contribution to meeting project objectives?

- a. Did team performance suffer due to personnel turnover?
- b. Are research disciplines undertaken by the PASA team too extended for the objectives of the project? Should some specialties be eliminated and concentration be limited to priority research requirements?
- c. Is there need for an additional administrative department for the PASA team in view of small number of group?
- d. Are commodities purchased or acquired by this project for PASA team utilized properly?

11. To what extent is the field trial officer arrangement operational? Is there need for more field trial officers? Are they acceptable to STRC and cooperating governments? How many countries are cooperating on seed trials and how many are planned by the FTOs before project phaseout?

- a. Who performs the evaluation and supervision of the FTOs?
- b. Is working arrangement between FTOs and PASA team members as well as cooperating governments conducive to achievement of project objectives?
- c. Is there need for instituting modifications in FTO work arrangements? Or in changing their assignment stations?

12. Are AID mission personnel in cooperating countries informed of project progress? Is mutual cooperation evident among AID regional and bilateral missions in the support of the project? Are there any proposals to improve communications and coordination of project with these missions and regional research organizations such as IITA?

13. Are trainees fully utilized under project objectives? What incentives do they require to be retained with the project after their training? What follow-up evaluations are carried out and how much on-job-training do they receive?

14. Is PASA team using coordinated and integrated approach of all team elements toward satisfying project objectives? Has there been an adequate volume of scientific reports produced by the team for publication? And what suggestions are there to improve team output and reduce its cost of operation?