

USAID/SAFGRAD/OAU - STRC/ICRISAT

West and Central Africa Sorghum Research Network
(WCASRN)

Grant N° 698-0452-G-00-6023-00

ANNUAL PROGRESS REPORT

June 1990 - May 1991

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International Crops Research Institute for the
Semi-Arid Tropics

(ICRISAT)

Patancheru, P. O., Andhra Pradesh 502 324
India

B.P. 320, Bamako, MALI

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INTRODUCTION

Program Description and Objectives

The West and Central Africa Sorghum Research Network (WCASRN) comprises of 17 member countries : Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Tchad, and Togo. Through the USAID/SAFGRAD/ICRISAT Grant No.698-0452-G-00-6023 the WCASRN addresses itself to the sorghum improvement problems of West Africa on a regional basis, concentrating on production constraints of significance to the 17 member countries. In addition to solving sorghum production problems, phase 2 of the WCASRN, which began in 1986, stresses training as an important and integral part of its activities. Most of the 17 countries in the Network have weak research programs in sorghum. Thus, the overall theme in the set of Network objectives is to strengthen the sorghum research capabilities of the national agricultural research systems (NARS).

The objectives of the WCASRN are :

- to increase the production of sorghum thereby contributing to the stabilization of food supplies in the region and contributing to improved nutrition and income for farmers in the drier areas of the region;
- to assist and strengthen national sorghum improvement programs, and contribute to their research needs in all agroecological semi-arid zones;
- to develop improved varieties and hybrids and agronomic/management practices capable of giving higher and more stable economic yields in the semi-arid environments;
- to facilitate the development of agricultural research manpower among West African nationals at all levels;
- to organize regional workshops and monitor uniform yields through field inspections.

Scope of the Report

This report summarizes the activities of WCASRN between June 1990 and May 1991. It covers progress made in the research projects funded by the Network in five NARS, results of the 1990 regional trials and nurseries, visits to NARS, important decisions taken at the eighth and ninth Steering Committee meetings, the fourth regional workshop, and the status of financial support to the non-lead NARS. In addition, there are sections on some difficulties and shortcomings encountered, activities planned for the coming year, and some suggestions for the future.

RESEARCH PROJECTS

Background Information on the Projects

At the fifth Steering Committee meeting of WCASRN held in Bamako between 5 and 11 May, 1989, it was decided that the Network should fund research projects in some of the NARS. Prior to that decision, national programs had been classified into lead, associate and technology adopting NARS (Table 1). The classification was based on the extent to which certain biotic and abiotic factors limited sorghum production in a given NARS. The availability of qualified scientists to carry out research on these stresses and on certain aspects of food technology was also taken into account.

Although funds are limited in WCASRN's budget for research activities, the Steering Committee thought that there was a need to encourage capable scientists in NARS to carry out research on problems common to sorghum production in the region. Based on the classification of NARS into lead, associate and technology adopting centers, five lead NARS were requested in 1989 to submit research proposals on various constraints. The five NARS and constraints were, Mali on head bugs, Burkina Faso on leaf anthracnose, Niger on long smut, Cameroon on *Striga*, and Nigeria on utilization (Table 1).

During the seventh Steering Committee of WCASRN, held in May 1990 in Niamey, it was agreed that Niger should submit a second research proposal on grain quality. Thus, with respect to lead centers and constraints (Table 1), there are no projects on stem borer and stand establishment (Nigeria) and on grain molds (Burkina Faso).

Project Titles, Principal Investigators and Objectives

There are two projects on plant pathology, and one each on entomology, *Striga* and wheat/sorghum composite flour.

The title of one of the pathology project is, Identification of Resistance to Leaf Anthracnose of Sorghum (*Sorghum bicolor*) caused by *Colletotrichum graminicola* (ces) Wilson in Burkina Faso. The principal investigator is Adama Neya, and the research is carried out at the Agronomic Station in Farako-Bâ, Burkina Faso. The project has two objectives. The first objective is to identify sources of resistance to leaf anthracnose of sorghum. The second objective is to find out if local races (pathotypes) of the leaf anthracnose fungus exist.

The second pathology project is on Long Smut Resistance in Sorghum. The research is carried out in Niger by Issoufou Kollo. The objectives of the project are to develop effective inoculation techniques and to screen sorghum germplasm from the Niger national program and from other national programs in the Network for resistance to long smut.

The entomology project is on Head Bugs of Sorghum carried out by Yacouba Doumbia in Mali. The objectives of this project are as follows:

- to determine the zones in Mali with high head bug infestation in farmers' fields;
- to evaluate the economic importance of head bugs in the different zones in which sorghum is grown in Mali;
- to study the biology of the insect;
- to develop a regional nursery for the study of stable resistance in sorghum to head bugs.

The project on *Striga* is on Screening of Local Sorghum Germplasm of Cameroon and Other Countries Against *Striga hermonthica* in Heavily Infested Field Conditions. The principal investigator is Richard Kenga and the research is carried out in Maroua, in Northern Cameroon. The major objective of the *Striga* project is to identify suitable sources of resistance in sorghum to *Striga*. Other objectives include the identification of a suitable screening methodology and multilocational testing in the region of genotypes identified from the project as resistant.

The title of the project on wheat-sorghum composite flour is, Technology for Production of Acceptable Wheat-Sorghum Composite Bread and Confectionery. The project is carried out at the Institute for Agricultural Research (IAR) at the Ahmadu Bello University, Zaria, Nigeria by L.B. Olugbemi and R.E. Aluko. The objectives of this project are:

- to develop a technology for producing acceptable local wheat-sorghum composite bread and confectionery, aimed at increasing the sorghum component as high as possible;
- to test the developed technology for wheat-sorghum composite bread and confectionery in industrial pilot plants;
- to test the new technology in selected commercial bakeries;
- to determine the acceptability in Nigerian markets of bread and confectionery produced from wheat-sorghum composite flour.

Progress of the Projects

Wheat Sorghum Composite Flour - Nigeria

The first meeting of the Grain Utilization Working Group was held at the Institute for Agricultural Research, Ahmadu Bello University, Zaria, in Northern Nigeria, on 13 September 1990. Except for the chairman of the Steering Committee, all members of the Working Group were present. In addition, the Team Leader of ICRISAT's Regional Program in Kano attended the meeting.

Major progress made after the first year included the identification of Farafara as the most suitable sorghum variety for wheat-sorghum composite bread

and confectionery. In the laboratory, acceptable bread can be produced with up to 50% level of wheat substitution by sorghum. Also, acceptable confectionery can be produced with up to 60% level of substitution. In general, it would appear that composite bread was lower in volume and had a shorter shelf-life than 100% wheat bread. The principal investigators hope to get into pilot production in the future. The technology they developed in the laboratory would be tested in two bakeries, one for bread and the other for confectionery. They also hope to carry out some economic studies on production.

Striga Project - Cameroon

Background on the *Striga* Project

The official project document from the national program of Cameroon was received in March 1990, and consisted of three sub-projects namely, screening of local germplasm of Cameroon and other countries, use of herbicide under sole and mixed crops, and the effect of intercropping on *Striga*. The project document was presented to the Steering Committee in April 1990. Since funds were extremely limited, the committee decided that the *Striga* project in Cameroon should concentrate on identifying resistant lines for further testing in various NARS in West and Central Africa. Thus, as a first step, the project multiplied eight varieties and two germplasm lines that had shown resistance to *Striga* during four years of testing in Northern Cameroon. Because the scientist who had carried out the crosses and tested these lines left Cameroon in December 1990, and because of damage in the post to the package in which the seeds were sent to the Coordinator, the first *Striga* Working Group was requested to finalize the project document and develop strategies for the continuation of the project.

First *Striga* Working Group Meeting

The meeting was held on 10 March, 1991 during the SAFGRAD Inter-Network Conference in Niamey. After examining the circumstances and the current situation, the members of the Working Group agreed on the following:

Currently, the following conditions prevail:

- *Striga* is a major problem on sorghum in Cameroon;
- there is an active national *Striga* program in the country;
- a *Striga* task force has been set up at the Institut de Recherche Agronomique (IRA) of Cameroon;
- the FAO/UNDP *Striga* project may take off very soon;
- although the senior sorghum breeder who had been involved in breeding activity against *Striga* had left, the national counterpart can continue the project as the principal investigator.

The following recommendations were made:

- the sorghum breeder at IRA was still in a position to carry out the objectives of the project, although it should include identifying suitable screening methodology which could be adapted for use and improved upon, if need be
- emphasis should be given to field screening
- the capabilities of the principal investigator could be enhanced through visits by other *Striga* scientists and the Coordinator and by visits of the principal investigator to other research stations in the region. He should be given opportunities by the Network to attend international meetings on *Striga* research
- screening should be extended to include local and improved varieties of Cameroon and other countries of the Network
- adequate quantities (about 500 g) of the varieties earlier indicated by Dr. Dangi and those considered promising by Kenga should be sent to the Coordinator for multilocational trials in 1991.

Head bugs - Mali

Results of 1990, the second year of the project, confirmed the following:

- *Eurystylus marginatus* was the most abundant species;
- based on mean number of individuals, both larvae and adults, the variety Elmota galmi was the most susceptible, whereas Kendé was the most resistant;
- based on visual assessment, using a scale of 1-5, damage was more severe in experimental stations than in farmers' fields;
- in studies on population dynamics two picks were observed, at the end of September and October. Both picks coincided with the milk stage of the grains.

Leaf anthracnose - Burkina Faso

Results from the second year's work of this project also confirmed several observations made during the first year.

These include:

- the composite spreader row technique was used to study the development of the disease in a total of 80 improved (introduced) and local genotypes. It was observed that the progress of the

was more rapid in improved genotypes than in local landraces. Severity of the disease reached 5, on a 1-6 scale, before physiological maturity in improved genotypes;

- seventy of the 80 lines were resistant (score of 3 or less in a 1-6 scale) to foliar infection, and 44 were resistant to foliar, stem and grain infection. All 44 were local landraces.

Preliminary work on the variability of the causal organism, the fungus *Colletotrichum graminicola*, during the off-season of 1989/90 indicated two types based on the color of their mycelium in culture.

Long Smut - Niger

The first complete report of this project covered work done in 1990. The project encountered logistic difficulties during 1989. In 1990, 11 out of 75 genotypes were highly resistant (score of 0, on a 1-4 scale) to long smut from natural inoculum. The results further showed a positive correlation between infection and the maturity cycle of the genotypes tested. Late maturing genotypes were more susceptible.

Project Funding and Accountability

Project titles, amount paid in dollars and CFA equivalent with dates, and technical and financial reports submitted as of May 15, 1991 are given in Table 2. At the eighth Steering Committee meeting held in Bamako on 3-4 December, 1990, it was agreed to fund the projects during 1991 as follows:

-	Head bugs in Mali	- \$ 8,000
-	Anthraxnose in Burkina Faso	- \$ 8,000
-	<i>Striga</i> in Cameroon	- \$ 8,000
-	Long smut in Niger	- \$ 6,000
-	Cereal quality in Niger	- \$ 5,000
-	Wheat/sorghum flour in Nigeria	- \$ 9,000.

Regional Outlook for Three of the Projects

With respect to the projects in Burkina Faso (anthracnose) and in Mali (head bugs) some of the varieties which showed resistance to both of these biotic constraints in 1990 were multiplied during the off-season at ICRISAT's facilities in Mali. Those for which their resistance were confirmed in 1990 will be put into two separate anthracnose and head bug regional trials for confirmation of their resistance. The Regional Sorghum Leaf Anthracnose Resistance Trial (RSLART) comprises 18 entries, one susceptible control and one resistant control. It will be grown in Burkina Faso, Mali, Nigeria and Niger in 1991. The sorghum Head Bug Resistance Trial will have 11 test entries and one susceptible control. The head bug trial will be grown in Mali, and also in Burkina Faso, Niger and Nigeria.

All the 12 test entries in the 1991 West African Sorghum *Striga* Trial (WASST) are genotypes contributed by the principal investigators of the *Striga* project in Cameroon, as recommended by the Steering Committee.

New Project on Grain Quality - Niger

This project was approved at the eighth Steering Committee meeting in Bamako, 3 and 4 December, 1990. However, funds were not made available until May 1991. The title of the project is: Morphologic, Chemical and Nutritive Characterization of Seeds of Local and Improved Sorghum in West and Central Africa. The objectives of the project are:

- to develop and conduct laboratory tests that can be used to characterize seeds of local and improved sorghums for human consumption;
- to analyze seeds of the best varieties from the Network trials and from national programs;
- to test germination percentage after 6, 9 and 12 months of storage under traditional conditions.

The tests will include, among other things, color, testa, endosperm texture, protein and tannin content, decortication, and use as flour.

VISITS TO NATIONAL PROGRAMS

Details of visits made to NARS are given below. During each of these visits, the Terms of Reference for Visits to National Programs developed by the Network acted as a guide. During these visits, information was obtained for the Network's Manpower Information Form. Separate reports on these visits are available on request.

<u>Country</u>	<u>Visited by</u>	<u>Month-Year</u>
Burkina Faso	Coordinator	July, August, 1990
Ghana	C.C. Nwasike*	August, 1990
Nigeria	Coordinator	September, 1990
Niger	Coordinator	September, 1990
Benin	S. Da*	September, 1990
Tchad	Coordinator and O.P. Dangi*	October, 1990
Burkina Faso	Coordinator (pre-season)	May, 1991

(An asterisk indicates Steering Committee member).

STEERING COMMITTEE MEETINGS

The eighth Steering Committee meeting was held in Bamako between 3 and 4 December, 1990. In addition to the usual observers, Global 2000, the Team Leaders of ICRISAT's programs in Bamako, Mali and Kano, Nigeria, principal staff from ICRISAT's program in Mali and a representative of IBPGR were present. Some of the more important decisions taken at that meeting were:

- the Network would start regional agronomy trials;
- an in-service training course on plant protection would be conducted at ICRISAT-Mali in September/October, 1991;
- financial support to the five projects were increased, so also was that for the 12 non-lead NARS; the latter from \$ 1,000 to \$ 2,000;
- \$ 12,000 for sorghum hybrid production training course for NARS to be held in September, at ICRISAT, Kano.

The ninth Steering Committee meeting was held in Niamey, March 13 and 14, 1991, during SAFGRAD's Inter-Network Conference. At that meeting, the Committee took the following important decisions:

- the working groups on the research project and the tenth Steering Committee meeting would be held concurrently at ICRISAT, Kano in November, 1991;
- the IRAT/CIRAD principal agronomist with ICRISAT/IRAT program in Mali should coordinate the proposed agronomy trials. He had initiated the idea at the eighth Steering Committee meeting.

The minutes of both these meetings are given in the Annex of this report.

FOURTH REGIONAL WORKSHOP

The fourth regional workshop was held in Niamey between 7 and 14 March, 1991 as part of the Inter-Network Conference for all of SAFGRAD' Networks. Twenty representatives from 15 NARS participated in the sorghum section of the conference. In addition, there were 16 other participants from various regional and intercontinental organizations, including seven principal staff and five research assistants from ICRISAT/IRAT in Bamako, ICRISAT Bilateral Program in Mali and ICRISAT in Kano. During the joint session of all the Networks, three scientific papers were presented from the Sorghum Network. In the separate Sorghum Network session, 10 scientific papers and 15 country reports were presented.

Recommendation groups on agronomy, breeding, plant protection, and sorghum utilization were formed. The recommendations of these groups and the general recommendations for the Sorghum Network as a whole are given in the Annex of this report.

FINANCIAL SUPPORT TO NON LEAD NARS

The 12 non-lead NARS to which \$ 1,000 were paid, and the status of expenses, with respect to acknowledgement and justification, are given in Table 3. Five of the 12 countries have not acknowledged receipt of the payment. In addition to acknowledging payment, the remaining 7 countries have sent a list of expenses incurred. Only one country had receipts attached to the list of expenses. The Network has not made any new payments for 1991 so far.

REGIONAL TRIALS AND NURSERIES

1990 Results

The West African Sorghum Variety Adaptation Trial (WASVAT-Early) had 20 entries. There were 17 test entries and three controls. The entries included varieties from the national programs of Cameroon, Senegal, Mauritania, Ghana, and from ICRISAT's West African Sorghum Improvement Program (WASIP). Fifteen sets of this trial were sent to 12 countries and results were received from 13 locations in 11 countries. The variety CE 196-7-2-1 had the highest mean yield (2.53 t ha^{-1}) for all 13 locations (Table 4). The top four test varieties after CE 196-7-2-1 were ICSV 1174 BF (2.26 t ha^{-1}), ICSV 401 IN (2.22 t ha^{-1}), ICSV 1172 BF (2.14 t ha^{-1}) and Nabana Beida (2.14 t ha^{-1}) (Table 4). The mean time to 50% flowering for all entries was between 68 and 77 days. The earliest variety was ICSV 1125 BF. Other earlier maturing varieties were ICSV 258 IN, ICSV 1174 BF and ICSV 1176 BF, all three of which flowered between 69 and 70 days (Table 5). Based on the mean for all 13 locations, plant height varied from 1.75 to 2.15 m. Among the test entries, ICSV 1177 BF was the tallest and ICSV 1172 BF was the shortest (1.75 m) (Table 6).

The West African Sorghum Variety Adaptation Trial (WASVAT-Medium) also had 20 entries of which three varieties were controls. The entries included varieties from Cameroon, Ghana, Niger, Senegal, Mauritania, Burkina Faso, Benin and WASIP. Nineteen sets of WASVAT-Medium were sent to 15 countries and results were received from 13 locations in 11 countries. The variety CS 85 had the highest mean yield of 2.09 t ha^{-1} for the 13 locations followed by Sepon 82 (1.96 t ha^{-1}), F2-20 (1.94 t ha^{-1}), IS 6928 (1.90 t ha^{-1}), and ICSV 1171 BF (1.83 t ha^{-1}) (Table 7). The mean time to 50% flowering for all entries was between 75 for BF 80-10/6-2-3 and 83 for IS 23526 (Table 8). Based on the mean for all 13 locations, plant height varied from 1.96 to 2.48 m. Among the test varieties, Niobougou was the tallest and ICSV 1171 BF the shortest (1.96 m) (Table 9).

The West African Sorghum Hybrid Adaptation Trial (WASHAT) was coordinated and the results analyzed by WASIP in Nigeria. Thus, the presentation of the data in Tables 10, 11 and 12 for this trial is slightly different from those of WASVAT-Early and -Medium.

WASHAT had 20 entries of which two were controls. Two of the test entries came from the national program of Niger whereas the rest were contributed by WASIP. WASHAT was grown in 10 locations. Grain yield was calculated from 8 locations. Based on the mean for those 8 locations, the highest yielding hybrid was ICSH 89002 NG (3.71 t ha^{-1}) followed by ICSH 89008 NG (3.68 t ha^{-1}), ICSH

89012 NG (3.56 t ha⁻¹) and ICSH 89007 NG (3.54 t ha⁻¹) (Table 10). The mean time to 50% flowering for all 10 locations was between 63 for ICSH 780 and 73 days for ICSH 89005 NG (Table 11). The mean height for all 10 locations for the test entries ranged from 1.62 m for ICSH 89012 NG to 1.93 m for ICSH 89001 NG (Table 12).

It is suggested that Tables 4, 7 and 10 should be closely studied in order to better appreciate the yield performances of the entries in different locations. For example, except for Nagawhite in WASVAT-Early, none of the controls ranked among the top three with regards to the combined mean yield across locations.

The West and Central Africa Sorghum *Striga* Trial (WCASST) consisted of 12 entries of which one was a local control. Eleven sets of WCASST were sent to 11 locations in eight countries. Results were received from three locations in three countries. In one of these locations, no *Striga* was recorded. The results from the two remaining locations indicated that ICSV 1001 BF (Framida) and ICSV 1078 were among the entries with the five lowest *Striga* counts. Other entries with low *Striga* counts in each of the two locations were ICSV 1079 BF, ICSV 1098 BF, ICSV 1115 BF and ICSV 1112 BF. *Striga* counts were based on the total number of *Striga* plants from the two center rows of 4-row plots at 90 days after sowing.

Mean *Striga* counts for the varieties mentioned above did not exceed 43. In contrast, the highest *Striga* counts obtained were 71 at one of the locations and 102 at the other.

The West African Sorghum Leaf Disease Nursery (WASDLN) had 25 entries and was dispatched to 8 locations in 7 countries. Results were received from 4 locations in 4 countries. The prevalent leaf diseases in these 4 countries were sooty stripe, gray leaf spot and leaf anthracnose. Six varieties, 84 S 82, 84 S 103-2, 84 S 126, ICSV 2 IN, ICSV 85 BF, and ICSV 1023 BF, were moderately resistant (3 or less, scale of 1-6) to all of the diseases at all locations. However, it is worth noting that 84 S 109 and IS 3443 were resistant (score of 2 or less) at the three locations where leaf anthracnose was reported. Leaf anthracnose is the most damaging sorghum leaf disease both in locals and introduced genotypes.

The list of the varieties and the programs which contributed them for all the trials are given in Annex 3.

1991 Trials

The numbers of each of the five trials and nurseries dispatched per country for 1991 are given in the table in the following page.

WEST AND CENTRAL AFRICA SORGHUM RESEARCH NETWORK (WCASRN)

Regional Trials and Nurseries

1991

Country	Trials and number of sets				
	WASVAT		<i>Striga</i>	Diseases	WASHAT
	Early	Medium			
Benin	0	1	0	0	1
Burkina Faso	2	2	0	1	1
Cameroon	1	1	1	1	2
CAR	0	1	0	0	0
Côte d'Ivoire	0	1	0	0	2
Gambia	1	0	1	0	0
Ghana	1	2	0	1	1
Guinea	0	1	0	1	0
Guinea Bissau	0	1	0	1	0
Mali	2	2	1	2	2
Mauritania	1	0	0	0	0
Niger	1	1	1	1	2
Nigeria	2	2	0	0	2
Senegal	1	1	1	0	1
Sierra Leone	1	1	0	1	0
Tchad	1	1	1	0	0
Togo	1	0	1	0	0
TOTAL DISPATCHED	15	18	7	9	14
TOTAL RESULTS RECEIVED					

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

DIFFICULTIES AND SHORTCOMINGS

Financial Accountability

Whereas financial accountability from lead NARS where the research projects are conducted has been fairly good, that from the 12 non lead NARS need improvement. It was difficult to get some NARS to acknowledge receipt of the \$ 1,000 paid to them. After reminders, financial reports were eventually received and for the most part without supporting documents. However, it should be recognized that it is sometimes difficult to get specific receipts for small purchases especially if they are made at a general market place.

Regional Trials

A number of varieties received from NARS for the 1990/91 off-season multiplication as entries in the 1991 trials either did not germinate or did not flower. In other cases, seeds were received too late for multiplication. In the latter case, the affected NARS were asked to furnish enough seeds from their stock. These arrived late, which in turn delayed the dispatch of the trials.

Translation of Reports and Other Network Documents

Thirteen of the 17 NARS in the Network are French speaking, yet more than 90% of the documents from the Network are in English. Although the Steering Committee has approved the recruitment of an individual on an ad hoc basis for this purpose, the availability of persons competent enough is a bottleneck. The present bilingual administrative secretary can type reports and other documents written in English directly into French. Perhaps, all documents should be produced in French in the first instance and then translated into English as and when it is necessary.

FUTURE PLANS

Since the present phase of the SAFGRAD project will end in December, 1991, no elaborate plans have been drawn up for the 1991/92 program of activities. Both the lead and non lead NARS will be requested to account for all payments made to them by December 15, 1991.

However, in planning for the future in Phase III of SAFGRAD project, it might be worth considering the following:

- a) Expand on-going research projects with NARS and initiate new ones. Thus, it is envisaged that the Network will become more of a "research" network than a "trials" network;
- b) Organize in-service training in various disciplines, but with emphasis on agronomy and food technology;

- c) Supervise seed multiplication and dispersal of regional trials and nurseries both by ICRISAT and by strong NARS with the requisite capability;
- d) Degree training up to M.Sc. and Ph.D levels according to the needs of the NARS;
- e) Assist the NARS in developing promising varieties and hybrids with high and stable yields;
- f) Facilitate the exchange of germplasm between member states;
- g) Organize annual research working groups on the collaborative research projects with active participation of NARS;
- h) Organize germplasm collection and evaluation within agronomic packages for the NARS;
- i) Organize once every two years scientific meetings and regional workshops as the forum for evaluating progress and planning for the future;
- j) Organize monitoring tours in years when scientific meetings and regional workshops are not scheduled.

An enormous effort should be made to ensure the flow of technology developed in the Lead Centers, where research projects are carried out, to the Associate Centers. In shifting the overall emphasis of the Network from a "trials Network" to a "research Network", this activity will become a priority. The role of a research associate as a Network staff will be extremely important in this regard by working closely with principal investigators in the Lead Centers, researchers in the Associate Centers, and encouraging the Technology Adopting Centers to implement the "finished" product.

Table 1. Distribution of the more important biotic and abiotic stress factors of sorghum and classification of national program for research purposes according to the prevalence of the stress factor and the manpower capability of the national programs into Lead, Associate, and Technology Adopting Centers.

Country	Insects		Diseases					Striga	Grain			
	PAN	BOR	GM	SS	AN	GL	LS		QL	UT	DR	ST
Burkina Faso	A	A	L	A	L	A		A	A		A	A
Cameroon				A	A	A		L			A	A
Mali	L		A	A	A	A	A	A	A		A	A
Niger		A					L		L		A	
Nigeria	A	L	A				A	A		A	A	L
Côte d'Ivoire	A											
Ghana	A		A									
Benin												
CAR												
Tchad												A
Gambia												
Guinea												
Guinea Bissau												
Mauritania												
Senegal												
Sierra Leone												
Togo												

1. Stress factors: PAN: panicle, BOR:boreers, GM: grain molds, SS: sooty stripe, AN: leaf and stem anthracnose, GL: gray Leaf spot, LS: Long smut, QL: grain quality, UT: grain utilization, DR: draught, ST: stand establishment. Classification: L: Lead Centers, A: Associate Centers. The others are Technology Adopting Centers.

Table 2. Country, project title, amount paid so far and reports received for the six research projects of WCASRN.

Country	Project title	Amount paid and date			Reports Received	
		\$	CFA	Date	Technical	Financial ³
Burkina Faso	Identification of sources of resistance to leaf anthracnose of sorghum (<i>Sorghum bicolor</i>) caused by <i>Colletotrichum graminicola</i> (ces) Wilson in Burkina Faso	2500	877500	28/6/89	Preliminary, 1989	Complete
		2500	787238	24/11/89	First year, 1989	Complete
		2500	712500	22/6/90	Second year, 1990	Partial
		4000	1120000	7/5/91		
Cameroon	Screening of local germplasms of Cameroon and other countries against <i>Striga hermonthica</i> in heavily infested field conditions	2500	705000	29/6/90	First year, 1990	Complete
		2500	700000	7/5/91		
Mali	Studies on head bugs of sorghum in Mali	2500	827500	26/6/89	Preliminary, 1989	Complete
		2500	790000	25/10/89	First year, 1989	Complete
		2500	712500	19/6/90	Second year, 1990	Partial
		2500	630500	26/10/90		
Niger	1. Identification of resistance to long smut 2. Morphologic, Chemical and Nutritive Characterization of seeds of local and improved sorghum in West and Central Africa	2500 ¹	-	-	Preliminary, 1989	None
		2500 ¹	-	-	Second year, 1990	None
		2500	700000	7/5/91	-	-
Nigeria	Technology for production of acceptable wheat-sorghum composite bread and confectionery	2500 ²	-	-	Preliminary, 1989	Complete
		2500 ²	-	-	First year 1989/90	Complete
		5589 ²	-	-		

1. Paid through ICRISAT Sahelian Center, Niamey.

2. Paid through ICRISAT, Kano.

3. Partial = some amount still need to be justified. Complete = Total amount justified.

Table 3. Status as of May 1991 of \$ 1,000 paid to 12 non-lead NARS in 1990.

Country	Acknowledged	Expenses justified ¹
Benin	No	-
CAR	Yes	Yes - with some receipts
Côte d'Ivoire	Yes	Yes - with some receipts
Gambia	No	-
Ghana	Yes	Yes - without receipts
Guinea	Yes	Yes - without receipts
Guinea Bissau	No	-
Mauritania	Yes	Yes - without receipts
Senegal	Yes	Yes - without receipts
Sierra Leone	Yes	Yes - without receipts
Tchad	No	-
Togo	No	-

1. Without receipt = only a list of items with corresponding amounts spent.

Table 4. Mean grain yield (t ha⁻¹) of early maturing varieties in the West African Sorghum Variety Adaptation Trial (WASVAT) from 13 locations grown in a randomized block design, three replications with plot size between 4.8 and 14.4 m², rainy season, 1990.

Entry	B. FASO		CAMEROUN		GAMBIA		GHANA		MAURITANIE		NIGER		SENEGAL		S.LEONE		TCHAD		TOGO		MALI		MALI		Mean		
	Saria	Farako-Ba	Guiring	Sapu	Nyankpala	Kaedi	Kollo	Bambey	Rokupr	Gassi	Tantiegou	Cinzana	Samanko	Mean													
CE 196-7-2-1	0.26	2	0.75	7	0.23	14	1.73	8	7.13	2	2.53	4	12.21	1	1.60	9	0.80	6	1.04	11	0.13	12	3.01	15	1.49	4	2.53
ICSV 1174 BF	0.17	8	1.56	2	0.71	5	2.00	6	5.80	10	0.87	13	7.99	6	2.00	6	1.20	2	2.61	3	0.26	2	3.05	14	1.10	8	2.26
ICSV 401 IN	0.22	5	0.56	9	0.71	5	1.73	8	6.26	7	0.69	15	7.10	12	2.69	2	0.48	12	1.59	7	0.13	12	4.86	1	1.87	2	2.22
ICSV 1172 BF	0.18	7	0.88	6	0.49	9	1.47	10	8.19	1	3.33	2	6.07	14	0.50	16	1.12	3	0.51	18	0.14	11	4.33	2	0.59	17	2.14
NABANA BEIDA	0.25	3	0.75	7	0.04	17	1.73	8	6.81	4	1.20	10	7.14	11	2.10	5	1.23	1	1.53	9	0.21	5	3.97	6	0.23	19	2.09
ICSV 1125 BF	0.17	8	0.75	7	0.47	10	1.87	7	5.78	11	1.33	9	6.98	15	1.10	12	0.41	14	2.83	2	0.14	11	3.65	8	1.35	7	2.06
CE 151-382	0.27	1	2.13	1	0.65	6	2.67	2	5.03	15	0.73	15	8.04	5	1.65	8	0.97	4	0.56	16	0.11	14	3.27	11	0.61	16	2.05
ICSV 1079 BF	0.22	5	0.00	12	0.51	8	2.40	4	5.39	13	1.29	8	9.16	3	1.30	11	0.69	8	0.96	14	0.14	11	3.22	12	0.77	14	2.00
ICSV 242 IN	0.25	3	0.25	11	1.16	1	1.87	6	6.49	5	1.07	11	7.61	9	2.20	4	0.53	11	1.01	12	0.15	10	2.60	16	0.79	13	2.00
LEKWERE BEDHA	0.25	3	1.50	3	0.65	6	2.80	1	4.97	16	0.45	18	7.82	7	2.36	3	0.56	10	0.76	15	0.22	4	2.08	17	0.97	10	1.95
ICSV 256 IN	0.23	4	0.94	5	0.37	12	2.80	1	4.61	18	0.93	12	7.80	8	1.00	14	0.37	15	1.56	8	0.18	7	3.51	10	0.69	15	1.92
ICSV 1177 BF	0.20	6	0.88	6	0.01	18	1.33	11	5.38	14	0.56	17	6.10	13	2.87	1	0.48	12	0.97	13	0.26	2	4.18	4	1.43	5	1.90
ICSV 1175 BF	0.17	8	0.75	7	0.11	15	2.53	3	4.64	17	0.60	16	8.13	4	1.35	10	0.32	16	0.53	17	0.17	8	4.07	5	0.93	11	1.87
ICSV 1170 BF	0.20	6	0.38	10	0.80	3	1.73	8	3.16	19	2.27	5	5.54	17	1.35	10	0.76	7	2.93	1	0.20	6	3.78	7	1.09	9	1.86
ICSV 1176 BF	0.14	9	0.75	7	0.97	2	1.60	9	5.46	12	1.44	7	7.49	10	0.45	17	0.32	16	1.98	5	0.18	7	2.03	18	0.18	20	1.77
CS 61	0.27	1	0.63	8	0.09	16	1.33	11	6.25	8	0.80	14	4.68	19	1.05	13	0.64	9	1.47	10	0.13	12	3.55	9	2.08	1	1.77
CS 54	0.27	1	0.00	12	0.77	4	1.20	12	6.29	6	1.73	6	5.06	18	0.50	16	0.44	13	0.33	20	0.24	3	3.13	13	1.81	3	1.67
CONTROL																											
NAGAWHITE	0.14	9	0.38	10	0.40	11	2.13	5	6.13	9	4.08	1	7.61	9	1.80	7	0.69	9	2.04	4	0.14	11	4.86	1	0.80	12	2.40
ICSV 111 IN	0.10	10	1.19	4	0.36	13	2.13	5	6.82	3	1.73	6	9.68	2	0.60	15	0.83	5	0.39	19	0.27	1	2.00	19	1.41	5	2.12
LOCAL	0.10	10	0.00	12	0.53	7	1.87	7	5.00	15	2.75	3	5.59	16	1.65	8	0.64	9	1.66	6	0.16	9	4.32	3	0.39	18	1.90
SE	±0.03		±0.68		±0.57		±0.33		±0.18		±0.81		±1.35		±0.13		±0.18		±0.52		±0.14		±0.43		±0.45		
MEAN	0.20		0.75		0.50		1.95		5.78		1.52		7.39		1.51		0.67		1.36		0.18		3.47		1.03		
CV(%)	15		75		12		23		49		71		22		33		38		50		52		16		46		

B.FASO = Burkina Faso. S.LEONE = Sierra Leone. Numbers following each yield value indicate the ranks.

Table 5. Number of days to 50% flowering of early duration genotypes in the West African Variety Adaptation Trial (WASV-Early) at 13 locations, rainy season, 1990.

Entry	B. FASO Saria	B. FASO Farako-Ba	CAMEROON Guiring	CAMBIA Sapu	GHANA Nyankpala	MAURITANIE Kaedi	NIGER Kollo	SENEGAL Bambey	S. LEONE Rokupr	TCHAD Gassi	TOGO Tantieyou	MALI Cinzana	MALI Samrko	Mean
NABANA BEIDA	72	83	56	70	72	87	68	77	122	73	81	68	8	77
ICSV 401 IN	62	89	56	69	80	76	71	75	78	72	72	67	8	74
ICSV 1170 BF	75	75	56	71	72	71	68	83	81	73	73	61	9	72
ICSV 1079 BF	62	81	55	69	85	82	66	74	77	76	73	61	3	72
CS 54	70	73	61	69	79	71	65	75	77	82	74	59	7	72
ICSV 1177 BF	77	83	57	73	73	78	65	74	72	71	69	61	8	72
ICSV 242 IN	73	76	56	70	77	75	78	82	61	71	78	58	71	71
LEKWERE BEDHA	72	86	56	70	72	80	65	78	70	73	71	63	70	71
CE 151-382	72	77	66	70	71	67	68	75	89	73	77	61	69	71
ICSV 1172 BF	72	77	58	70	76	70	64	75	72	70	79	59	77	71
CE 196-7-2-1	58	83	60	61	85	73	80	83	80	72	77	62	3	71
CS 61	56	69	56	69	65	76	70	79	88	74	78	67	9	70
ICSV 1175 BF	66	77	66	69	76	67	63	71	72	72	73	66	77	70
ICSV 1176 BF	66	67	63	68	73	67	69	75	76	70	70	61	79	70
ICSV 1174 BF	60	83	60	61	65	67	59	68	72	72	81	62	69	69
ICSV 258 IN	62	73	55	69	70	87	65	72	71	71	71	61	71	69
ICSV 1125 BF	62	80	60	65	71	65	70	68	72	67	65	59	80	68
CONTROL														
NAGAWHITE	63	73	56	67	68	80	67	71	81	77	70	67	72	70
ICSV 111 IN	68	81	62	62	85	66	64	70	83	73	81	61	77	72
LOCAL	62	93	62	62	73	72	74	72	84	77	68	51	77	72
SE	± 1.80	± 2.41	± 1.09	± 1.07	± 1.03	± 5.20	± 1.43	± 3.28	± 10.72	± 1.8	± 1.47	± 0.0	± 4.70	
MEAN	67	79	59	67	75	74	68	75	79	73	74	62	74	
CV(%)	3	4	2	2	2	9	3	5	16	3	2	2	8	

B. FASO = Burkina Faso. S. LEONE = Sierra Leone.

Table 6. Mean plant height (m) of early genotypes in the West African Sorghum Variety Adaptation Trial (WASVAT-Early) at 13 locations, rainy season, 1990.

Entry	B.FASO	B.FASO	CAMEROUN	GAMBIA	GHANA	MALI	MAURITANIE	NIGER	SENEGALS.	LEONE	TCHAD	TOGO	MALI	Mean
	Saria	Farako-Ba	Guiring	Sapu	Nyankpala	Cinzana	Kaedi	Kollo	Bambey	Rokupr	Gassi	Tantiegou	Samanko	
ICSV 1177 BF	2.35	2.05	2.31	3.00	1.39	1.96	1.80	2.30	2.35	1.21	1.68	1.70	3.90	2.15
CE 196-7-2-1	1.77	2.50	2.18	3.00	1.82	2.25	1.60	3.15	2.55	1.41	1.76	1.45	1.70	2.09
ICSV 1079 BF	1.95	1.80	2.26	1.90	1.70	3.95	1.60	2.30	2.10	1.35	2.03	1.56	2.00	2.04
ICSV 1176 BF	1.74	1.80	3.13	2.40	1.74	2.22	1.75	2.25	1.70	1.94	1.50	1.90	2.10	2.01
CE 151-382	1.87	1.45	3.00	2.10	1.69	2.15	1.70	2.80	2.10	1.45	1.92	1.74	2.05	2.00
CS 54	1.64	1.60	1.87	2.30	1.72	2.17	1.70	2.40	1.75	1.29	2.03	1.94	3.60	2.00
ICSV 1175 BF	1.84	1.40	2.50	2.40	1.68	2.98	1.60	2.00	2.30	1.94	1.42	1.63	2.30	2.00
ICSV 242 IN	2.41	2.05	2.19	2.20	1.10	1.77	1.85	3.65	1.70	1.32	1.65	1.85	2.10	1.99
ICSV 1174 BF	1.31	3.75	2.41	1.70	1.54	2.10	1.80	1.80	2.05	1.62	1.60	1.69	1.85	1.94
ICSV 1125 BF	1.86	2.40	2.76	1.60	1.49	1.98	1.50	2.60	2.00	1.27	1.53	2.16	1.85	1.92
ICSV 1170 BF	1.91	1.70	2.09	2.00	1.42	2.15	1.90	2.90	2.50	1.57	1.63	1.74	1.45	1.92
LEKWERE BEDHA	1.54	2.00	2.16	2.60	1.34	2.49	1.65	2.20	1.85	1.28	1.52	1.88	1.95	1.88
ICSV 258 IN	1.77	2.00	1.82	1.80	1.70	1.99	1.90	2.60	1.80	1.33	1.46	1.94	2.15	1.87
CS 61	1.58	1.50	2.05	2.60	1.41	2.16	1.65	2.60	1.65	1.26	1.38	1.87	1.80	1.81
NABANA BEIDA	1.75	2.00	1.99	2.30	1.60	2.16	1.10	1.80	1.45	1.85	1.72	1.46	2.00	1.78
ICSV 401 IN	1.91	1.60	2.09	1.60	1.55	2.37	1.75	2.80	1.80	1.00	1.59	1.46	1.65	1.78
ICSV 1172 BF	2.00	1.80	1.31	2.70	1.89	1.72	1.60	1.60	1.75	1.27	1.07	1.93	2.10	1.75
CONTROL														
NAGAWHITE	1.28	1.90	2.11	2.10	2.27	1.63	1.75	2.30	2.05	1.50	2.05	1.56	1.90	1.88
ICSV 111 IN	2.22	2.00	1.93	2.50	1.51	2.07	1.35	2.50	1.50	1.42	2.23	1.70	1.70	1.89
LOCAL	1.79	1.80	2.40	2.20	1.74	1.51	1.40	3.10	1.95	1.18	1.05	1.74	2.10	1.84
SE	±0.11	±0.08	±0.15	±0.14	±0.11	±0.11	±0.18	±0.20	±0.22	±0.20	±0.02	±0.11	±0.22	
MEAN	1.82	1.96	2.23	2.25	1.62	2.19	1.65	2.48	1.95	1.42	1.64	1.75	2.11	
CV(%)	7	5	8	7	8	6	14	10	15	19	1	8	13	

B.FASO = Burkina Faso. S.LEONE = Sierra Leone.

Table 7. Mean grain yield (t ha⁻¹) of medium maturing varieties in the West African Sorghum Variety Adaptation Trial (WASVAT-Medium) from 13 locations grown in a randomized block design, three replications with plot size between 4.8 and 14.4 m², rainy season, 1990.

Entry	B. FASO		CAMEROON		C.D'IVOIRE		GAMBIA		GHANA		GUINEE		MALI		MALI PAR		NIGER		SENEGAL		S.LEONE		TCHAD		Mean		
	Farako-Ba	Saria	Sanguere	Ferke	Sapu	Nyankpala	Kankan	Samanko	Samanko	Bengou	Nioro	Rokupr	Cassi														
CS 85	2.50	4	2.31	7	1.00	14	1.35	13	1.70	13	0.83	3	0.01	16	4.00	2	3.00	2	3.39	1	5.66	5	0.64	7	0.83	8	2.09
SEPON-82	2.75	3	3.12	1	0.35	18	2.79	7	1.78	9	0.01	18	0.71	5	3.47	7	2.92	12	1.46	11	5.47	6	0.72	3	0.54	12	1.96
F2-20	2.50	4	3.06	3	1.23	12	2.81	3	1.85	6	0.39	11	1.76	2	1.73	14	1.99	11	1.06	13	5.86	4	0.68	5	0.33	16	1.94
IS 6928	2.50	4	2.80	5	1.89	8	0.73	14	2.66	2	0.49	10	0.00	17	3.53	6	3.41	1	1.46	11	2.93	12	0.39	11	1.89	1	1.90
ICSV 1171 BF	2.50	4	2.28	8	0.03	19	2.92	2	1.97	4	0.33	12	1.75	3	3.53	6	1.75	13	1.86	8	2.83	13	0.53	8	1.52	3	1.83
ICSV 1163 BF	2.50	4	1.95	11	2.67	4	2.08	8	1.04	14	0.55	9	0.11	13	3.40	8	1.64	14	1.99	6	3.81	9	0.32	14	0.83	6	1.76
BF 80-10/6-2-3	1.44	12	2.86	4	1.34	11	2.71	4	1.75	10	0.08	16	1.69	4	3.93	11	2.15	9	1.73	9	2.83	13	0.39	11	0.72	8	1.74
BF 82-3/25-1-1	0.75	14	2.34	6	0.39	17	2.08	8	0.60	19	0.13	15	2.61	1	3.00	10	1.80	12	2.13	5	5.66	5	0.35	13	0.64	10	1.73
NSV-1	1.31	13	3.09	2	2.81	2	1.88	10	0.74	18	0.07	17	0.13	12	1.73	14	2.53	4	0.20	16	6.64	3	0.43	9	0.37	15	1.69
CS 95	2.38	5	0.16	17	0.44	16	1.46	12	1.60	11	0.85	2	0.27	8	1.80	13	2.25	7	3.46	2	6.74	2	0.85	1	0.08	19	1.72
NIOBOUGOU	1.88	7	2.05	10	2.51	5	2.81	3	0.20	20	0.76	4	0.24	10	1.47	15	2.44	5	1.73	9	3.22	11	0.81	2	1.12	4	1.63
BF 82-4/4-1-1	3.25	2	1.56	14	0.01	20	1.98	9	1.96	5	0.67	7	0.35	6	3.60	5	2.17	8	0.94	14	3.32	10	0.27	15	0.40	13	1.58
BLANC KARIMANA	1.81	8	1.33	15	3.01	1	0.62	15	1.53	12	0.64	8	0.17	11	0.13	16	0.92	17	2.13	5	6.93	1	0.37	12	0.55	11	1.55
ICSV 1157 BF	1.63	10	2.05	10	2.36	6	2.60	5	0.78	17	0.76	4	0.33	7	3.73	4	1.75	13	2.66	4	0.00	15	0.66	6	0.84	5	1.55
TAKMALIT	0.50	15	1.92	12	1.17	13	3.44	1	1.84	7	0.32	13	0.25	9	4.13	1	2.01	10	1.20	12	0.29	14	0.69	4	0.78	7	1.43
IS 23526	3.38	1	2.28	8	0.91	15	0.42	16	1.03	15	0.39	11	0.17	11	2.67	12	1.29	16	1.60	10	0.00	15	0.40	10	1.65	2	1.25
IS 22380	2.13	6	0.10	18	2.79	3	1.35	13	2.15	3	0.75	5	0.10	14	3.40	8	1.37	15	0.93	15	0.29	14	0.39	11	0.03	20	1.21
CONTROL																											
ICSV 1063 BF	1.50	11	2.24	9	1.84	9	2.39	6	3.17	1	0.17	14	0.11	13	3.07	9	0.40	18	2.79	3	5.86	4	0.35	13	0.67	9	1.89
ICSV 1089 BF	1.75	9	0.91	16	1.51	10	2.08	8	0.99	16	1.07	1	0.02	15	3.87	3	2.33	6	1.86	8	4.20	8	0.37	12	0.38	14	1.64
LOCAL	2.38	5	1.69	13	-1.91	7	1.67	11	1.81	8	0.71	6	0.10	14	1.47	15	0.30	19	1.93	7	4.98	7	0.66	6	0.15	17	1.52
SE	±0.28		±0.39		±0.73		±0.42		±0.39		±0.21		±0.36		±0.35		±2.27		±0.57		±0.93		±0.11		±0.34		
MEAN	1.94		1.89		1.46		1.91		1.47		0.46		0.54		2.63		1.77		1.66		3.59		0.48		0.67		
CV(%)	18		26		64		27		31		44		120		16		22		42		27		27		63		

B. FASO = Burkina Faso. C. D'IVOIRE = Cote d'Ivoire. S. LEONE = Sierra Leone. PAR = Point d'Appui de Recherche.

Table 8. Number of days to 50% flowering of early duration genotypes in the West African Sorghum Variety Adaptation Trial (WASVAT-Medium), rainy season, 1990.

Entry	B.FASO Farako-Ba	B.FASO Saria	CAMEROUN Sanguere	C.D'IVORE Ferke	GAMBIA Sapu	GHANA Nyankpala	GUINEE B. Kankan	MALI Samanko	NIGER Bengou	SENEGAL Niore	S.LEONE Rokupr	TCHAD Gassi	MALI PAR Samanko	Mean
IS 23526	72	83	74	88	84	79	83	83	83	94	98	80	78	83
CS 95	72	99	74	67	71	98	74	68	77	70	130	90	83	83
BLANC KARIMANA	81	87	69	84	77	87	83	67	90	74	102	77	94	83
NSV-1	81	87	67	61	73	105	79	83	95	74	94	78	91	82
ICSV 1163 BF	76	86	74	61	82	82	130	77	79	75	87	79	78	82
CS 85	76	76	73	75	79	92	94	74	79	75	104	77	86	81
TAKMALIT	82	97	73	68	69	72	79	76	88	92	85	80	92	81
NIOBOUGOU	86	80	66	68	91	70	83	96	83	75	83	79	90	80
ICSV 1171 BF	74	69	86	71	69	79	74	83	79	77	110	77	89	80
BF 82-3/25-1-1	84	83	82	72	91	98	62	81	67	69	85	81	81	80
ICSV 1157 BF	82	86	73	61	69	80	74	79	75	99	92	75	90	79
F2-20	74	80	64	84	69	89	72	90	75	75	78	87	92	79
IS 22380	64	99	61	74	67	79	85	81	79	91	84	72	91	79
SEPON-82	84	83	76	72	69	72	72	78	79	75	90	79	91	78
IS 6928	64	78	74	73	69	82	98	77	86	78	82	75	81	78
BF 82-4/4-1-1	81	86	76	71	71	85	67	74	75	76	86	80	89	78
BF 80-10/6-2-3	86	78	62	68	75	72	62	83	68	72	87	80	83	75
CONTROLS														
ICSV 1063 BF	81	83	69	68	79	85	83	68	79	70	97	81	98	80
ICSV 1089 BF	77	83	69	67	69	86	85	90	77	74	78	77	95	79
LOCAL	76	95	73	71	74	83	92	78	86	76	102	87	83	83
SE	± 1.71	± 14.57	± 4.41	± 0.96	± 1.23	± 4.43	± 3.1	± 4.80	± 4.74	± 2.45	± 2.86	± 4.82	± 2.11	
MEAN	78	85	72	71	75	84	82	79	80	78	93	80	88	
CV(%)	3	23	7	2	2	6	5	7	7	4	4	7	3	

B. FASO = Burkina Faso. S. LEONE = Sierra Leone.

Tableau 9. Mean plant height (m) of medium duration genotypes in the West African Sorghum Variety Adaptation Trial (WASVAT-Medium) at 12 locations, rainy season, 1990.

Entry	B.FASO Farako-Ba	B.FASO Saria	CAMEROUN Sanguere	C.D'IVOIRE Ferre	GAMBIA Sapu	GHANA Nyankpala	GUINEE B. Kankan	MALI Samanko	SENEGAL Niore	S.LEONE Rokupr	TCHAD Gassi	MALI PAR Samanko	Mean
NIOBOUGOU	2.90	2.06	2.28	2.25	4.50	3.06	1.30	4.85	1.55	1.27	1.69	2.05	2.48
IS 23526	2.40	2.51	2.27	4.00	2.90	1.47	1.30	3.15	4.15	1.14	2.05	1.65	2.42
BF 82-3/25-1-1	3.30	1.83	3.57	2.45	5.00	1.99	2.00	2.25	1.95	1.05	1.95	1.35	2.39
ICSV 1157 BF	4.30	1.79	1.97	2.50	3.90	1.24	1.05	2.20	4.40	1.08	2.18	1.85	2.37
TAKMALIT	4.40	2.64	2.25	2.45	2.40	1.36	1.70	1.75	2.85	1.43	1.91	2.30	2.29
CS 95	2.00	3.72	1.77	2.35	2.20	3.08	1.45	2.15	2.20	1.86	2.44	2.10	2.28
NSV-1	3.10	1.55	1.63	2.10	2.20	3.38	1.60	3.05	2.10	1.19	2.82	1.81	2.21
BF 80-10/6-2-3	4.50	1.55	2.72	1.95	2.30	1.28	1.80	2.75	2.35	1.24	2.52	1.47	2.20
IS 22380	2.15	3.26	1.90	2.50	2.40	1.19	1.25	2.10	2.60	1.20	3.35	2.50	2.20
F2-20	2.50	1.75	1.75	3.25	2.30	1.30	1.65	4.45	1.95	1.26	1.79	2.10	2.17
BLANC KARIMANA	1.85	1.41	1.92	2.95	2.40	1.47	1.75	4.85	2.05	1.16	2.19	1.92	2.16
SEPON-82	2.40	2.02	2.75	2.20	1.90	1.45	1.50	2.25	2.10	1.42	1.88	3.72	2.13
ICSV 1163 BF	2.15	1.79	1.95	1.95	3.00	1.41	3.30	2.10	2.80	1.15	1.66	1.65	2.08
IS 6928	2.40	1.82	2.06	2.85	2.20	1.61	2.75	2.10	1.95	1.03	1.99	1.95	2.06
CS 85	2.30	1.79	1.80	3.10	2.40	2.00	1.60	2.25	1.95	1.16	2.25	1.90	2.04
BF 82-4/4-1-1	2.60	1.56	2.56	2.60	2.30	1.85	1.10	2.15	1.80	1.10	2.24	1.82	1.97
ICSV 1171 BF	2.15	1.81	3.70	2.40	1.80	1.22	1.90	2.10	1.85	1.16	1.83	1.67	1.96
CONTROL													
ICSV 1063 BF	2.70	1.75	1.50	2.30	3.20	1.35	1.05	2.05	1.60	1.78	2.52	4.05	2.15
ICSV 1089 BF	2.50	1.50	1.75	2.25	2.10	1.38	1.25	3.35	1.80	0.98	2.02	3.50	2.03
LOCAL	2.20	2.00	1.86	2.70	2.80	1.87	1.90	2.40	2.10	1.10	2.21	1.95	2.01
SE	± 0.11	± 0.19	± 0.11	± 0.17	± 0.19	± 0.15	± 0.26	± 0.11	± 0.13	± 0.19	± 0.44	± 0.08	
MEANS	2.74	2.01	2.20	2.56	2.71	1.75	1.66	2.72	2.31	1.19	2.17	2.17	
CV(%)	5	12	6	8	9	10	21	5	7	17	25	4	

B. FASO = Burkina Faso. C. D'IVOIRE = Cote d'Ivoire. S. LEONE = Sierra Leone. PAR = Point d'Appui de Recherche.

TABLE 10. GRAIN YIELD (T/HA-1) PERFORMANCE OF TEST HYBRIDS ACROSS EIGHT LOCATIONS IN THE WEST AFRICAN SORGHUM HYBRID ADAPTATION TRIAL (WASHAT) - 1990.¹

ENTRY	DESIGNATION	BAGAUDA	TILEBERY	MAROUA	SANGUERE	SAMANKO	SOTUBA	CINZANA	FERKE	MEAN
1	ICSH 780	5.50(6)	4.32(10)	5.04(10)	3.62(2)	1.81	2.15(9)	3.53(5)	1.65(10)	3.45(7)
2	ICSH 89001 NG	6.26(1)	-	5.23(5)	3.53(4)	2.20	1.78	3.21(10)	1.65(10)	3.41(9)
3	ICSH 88038	4.54	4.34(9)	4.24	3.26(6)	1.76	1.78	3.65(3)	1.79(6)	3.17
4	ICSH 89005 NG	4.78	5.31(3)	4.29	2.01	1.59	2.09	3.22(9)	1.35	3.08
5	ICSH 89006 NG	5.40	-	5.19(7)	3.58(3)	1.92	2.16(8)	3.40(6)	1.52	3.31
6	ICSH 507	5.41(10)	4.46(3)	5.34(3)	3.02(9)	2.79(3)	2.07	3.34(7)	1.65(10)	3.51(6)
7	ICSH 89002 NG	5.74(4)	5.57(2)	4.92	3.22(7)	2.89(1)	2.48(2)	2.89	1.98(1)	3.71(1)
8	ICSH 89007 NG	5.41(10)	4.67(5)	5.86(1)	2.76	2.22	2.13(10)	3.63(4)	1.60	3.54(4)
9	ICSH 89008 NG	5.80(3)	4.94(4)	5.14(8)	3.33(5)	2.37(7)	2.54(1)	3.40(6)	1.90(4)	3.68(2)
10	ICSH 89009 NG	5.51(5)	4.00	5.01	2.39	2.82(2)	2.02	3.30(8)	1.94(2)	3.37(10)
11	ICSH 89010 NG	5.44(9)	4.53(7)	4.42	3.05(8)	2.37(7)	2.29(4)	2.31	1.71(8)	3.27
12	ICSH 89011 NG	4.94	4.66(6)	4.96	3.86(1)	2.27(9)	2.01	2.86	1.92(3)	3.44(8)
13	ICSH 89012 NG	5.46(7)	5.68(1)	5.10(9)	3.58(3)	2.41(6)	2.42(3)	2.10	1.73(7)	3.56(3)
14	ICSH 89013 NG	5.45(8)	3.97	4.64	2.48	2.42(5)	2.17(7)	3.72(2)	1.83(5)	3.34
15	ICSH 89004 NG	5.30	4.04	5.29(4)	2.92(10)	2.31(8)	1.81	2.71	1.52	3.24
16	ICSH 89014 NG	6.25(2)	3.85	5.20(6)	2.39	2.53(4)	2.24(5)	3.99(1)	1.67(9)	3.52(5)
17	INRAN HYBRID-1	5.04	2.93	4.56	2.63	2.26(10)	2.15(9)	2.28	1.37	2.90
18	INRAN HYBRID-2	3.26	2.17	3.98	1.45	1.28	2.04	2.22	0.73	2.14
19	ICSV 111	4.83	3.62	4.94	2.75	2.20	2.23(6)	2.96	1.15	3.09
20	LOCAL CONTROL	3.68	3.00	5.74(2)	1.06	1.74	1.46	2.62	1.23	2.57
	\bar{X}	5.20	4.23	4.96	2.84	2.21	2.10	3.07	1.59	3.27
	SE	+0.354	+0.617	+0.257	+0.567	+0.400	+0.214	+0.323	+0.201	
	%CV	12	25	9	34	31	18	18	22	

1. Data received from two locations, Maradi and Bouake, were excluded from further analyses due to >50% CV. Numbers in parenthesis indicate the rank of the entry. The local control at various locations was different.

TABLE 11: TIME TO 50% FLOWERING (d) OF TEST HYBRIDS ACROSS TEN LOCATIONS IN THE WEST AFRICAN SORGHUM HYBRID ADAPTATION TRIAL (WASHAT) - 1990

ENTRY	DESIGNATION	BAGAUDA	TILEBERY	MARADI	MAROUA	SANGUERE	SAMANKO	SOTUBA	CINZANA	FERKE	BOUAKE	MEAN
1	ICSH 780	63	59	65	54	58	73	69	59	62	69	63
2	ICSH 89001 NG	61	-	75	55	61	65	69	60	61	67	64
3	ICSH 88038	65	67	72	58	62	75	76	62	67	75	68
4	ICSH 89005 NG	68	72	81	62	71	81	83	65	71	79	73
5	ICSH 89006 NG	65	-	75	60	66	78	78	61	66	79	70
6	ICSH 507	61	67	76	55	61	69	72	61	62	66	65
7	ICSH 89002 NG	67	68	77	58	66	71	76	61	66	73	68
8	ICSH 89007 NG	66	67	79	56	64	78	78	63	64	71	69
9	ICSH 89008 NG	62	63	76	57	59	73	73	62	65	71	66
10	ICSH 89009 NG	63	64	74	55	65	74	76	62	65	71	67
11	ICSH 89010 NG	65	67	75	61	67	75	79	61	67	73	69
12	ICSH 89011 NG	63	64	73	57	63	77	76	62	65	70	67
13	ICSH 89012 NG	65	67	76	58	62	77	76	64	65	72	68
14	ICSH 89013 NG	67	69	76	62	68	74	76	62	68	73	70
15	ICSH 89004 NG	64	65	78	56	60	77	76	60	64	69	67
16	ICSH 89014 NG	62	64	72	55	62	72	71	63	62	70	65
17	INRAN HYBRID-1	67	67	72	59	69	75	74	61	67	73	68
18	INRAN HYBRID-2	64	69	76	61	71	80	77	64	70	73	71
19	ICSV 111	63	68	78	57	69	72	72	61	61	62	66
20	LOCAL CONTROL	63	71	59	57	71	87	84	61	61	63	68
	\bar{X}	64	66	74	58	65	75	77	62	65	71	68
	SE	+0.5	+0.9	+2.8	+0.9	+0.8	+3.5	+1.4	+1.1	+0.6	+2.5	
	%CV	2	3	7	3	5	8	3	3	2	6	

TABLE 12: PLANT HEIGHT (cm) OF TEST HYBRIDS ACCROSS TEN LOCATIONS IN THE WEST AFRICAN SORGHUM HYBRID ADAPTATION TRIAL (WASHAT) - 1990

ENTRY	DESIGNATION	BAGAUDA	TILEBERY	MARADI	MAROUA	SANGUERE	SAMANKO	SOTUBA	CINZANA	FERKE	BOUAKE	MEAN
1	ICSH 780	195	141	138	208	171	165	193	208	202	183	180
2	ICSH 89001 NG	220		133	212	190	173	206	204	211	187	193
3	ICSH 88038	195	150	138	199	178	170	196	213	207	157	181
4	ICSH 89005 NG	197	151	135	203	169	167	192	202	205	162	178
5	ICSH 89006 NG	210		152	219	180	180	207	207	212	157	192
6	ICSH 507	193	161	130	211	169	175	193	199	198	165	179
7	ICSH 89002 NG	215	157	138	211	170	180	209	213	224	182	190
8	ICSH 89007 NG	190	147	108	178	169	163	172	188	191	167	167
9	ICSH 89008 NG	197	165	122	198	181	168	191	207	205	182	182
10	ICSH 89009 NG	198	148	133	173	158	170	191	205	200	187	176
11	ICSH 89010 NG	197	143	140	199	176	177	204	175	199	177	179
12	ICSH 89011 NG	197	150	125	187	178	175	185	184	204	165	176
13	ICSH 89012 NG	185	144	122	188	170	153	166	152	186	152	162
14	ICSH 89013 NG	218	169	153	217	195	178	204	224	218	182	196
15	ICSH 89004 NG	202	148	115	200	177	163	185	183	206	178	176
16	ICSH 89014 NG	223	153	147	221	155	170	195	218	213	167	186
17	INRAN HYBRID-1	200	148	133	194	158	173	181	168	206	150	171
18	INRAN HYBRID-2	205	234	132	199	170	175	178	184	211	157	185
19	ICSV 111	222	173	167	217	199	170	208	230	213	122	192
20	LOCAL CONTROL	188	231	170	226	181	408	148	350	233	155	229
	\bar{X}	202	163	137	203	175	183	190	206	207	166	183
	SE	+5.3	+13.6	+11.3	+7.9	+5.5	+4.8	+5.1	+8.1	+4.4	+8.1	
	%CV	5	15	14	7	21	5	5	7	4	8	

A N N E X 1

MINUTES OF EIGHTH AND NINTH STEERING COMMITTEE

MINUTES OF THE 8TH STEERING COMMITTEE MEETING
OF THE WEST AND CENTRAL AFRICA SORGHUM RESEARCH
NETWORK (WCASRN)
BAMAKO, MALI
DECEMBER 3 - 4, 1990

Participants

1. M. D. Traoré	Mali	member/Chairman
2. J.W. Clark	Niger	member
3. C.C. Nwasike	Nigeria	member
4. M.D. Thomas	SAFGRAD/ICRISAT	member/Coordinator
5. K.V. Ramaiah	ICRISAT	observer
6. T. Bezuneh	SAFGRAD	observer
7. G. Kingma	USAID/SAFGRAD	observer
8. O. Ajayi	ICRISAT	observer
9. P. Salez	CIRAD	observer
10. A. Kéré	INSAH	observer
11. M. Galiba	Global 2000	observer

General

The Steering Committee Chairman opened the meeting, welcomed the members and observers, and thanked the representatives of Global 2000, INSAH and CIRAD for their attendance. The Coordinator described the efforts to contact the Steering Committee members from Cameroon, Burkina Faso and Chad and explained the circumstances behind their absence.

The minutes of the seventh Steering Committee meeting were read and adopted without amendment.

Matters Arising From the 7th Steering Committee Meeting

1. Dr. Clark reported on contributions received for the Sorghum Newsletter - 2 from Niger and 1 from WASIP-Kano;
2. The Sorghum Utilization Conference scheduled for November 27 to December 1, 1990 was postponed to an indefinite date in 1991;
3. The Committee agreed that critical observations concerning Network partners or organizations should be attributed to the Committee and not to individual members.
4. Promotion and Exploitation of Promising New Lines
Stability analysis of 1987-89 variety trials is underway at ISC in Niamey but not yet completed. The Coordinator

will follow-up on this. Seeds of ICSV 1083 BF, CE 180-83, ICSV 111, of WASVAT-Early and ICSV 1063 BF, ICSV 1089 BF, Malisor 84-1 of WASVAT-Medium cycle trials should be multiplied. Technical description (fiches techniques) are needed on these varieties.

Multilocational trials were recommended to exploit these materials, especially at the 5 lead centers and 6 other NARS -Senegal, Benin, Gambia, Togo, Ghana and Côte d'Ivoire. It was recommended that the multiplication of these varieties be coordinated with INSAH. A clearly defined strategy for the exploitation of new varieties needs to be developed during the joint network workshop. NAR cooperators in the multi-locational trials will be requested to fill out technical information forms on the varieties under evaluation.

5. **Lead Centers**

The Committee expressed concern about the continuity of the *Striga* project financed by the Network after the departure of Dr. Dangi. The SCO agreed to write to the Director of Agronomic Research, Dr. Ayuk-Takem, to encourage the Cameroon program to continue with a strong commitment to this project.

The establishment of a *Striga* working group composed of WASIP-Mali, the *Striga* Network and Cameroon representatives was recommended to follow-up and advise the research staff.

Coordinator's Report

Dr. Thomas summarized the Coordinator's report for 1990.

1. Research projects - a table in the report listed the funds provided and project reports received.
2. Regional trial status - the number of trials dispatched and results analyzed was presented in table 3 of the report.
3. Seed multiplication for 1991 trials - the varieties received from NARS and the quantity of seed increased was summarized.
4. Visit to NARS in 1990 - the countries visited and visiting scientists were listed.
5. Financial situation - the budget, expenditures and balance as of July 1990 were presented in an Annex.

6. Reports - the reports completed or in preparation by the Coordinator's office were listed.

The Committee requested information on the agronomic potential of the lines for disease nursery trials.

SCO Report

Dr. Bezuneh and Dr. Kingma explained the status of SAFGRAD II and III. SAFGRAD II will end in September, 1991. USAID will conduct a final evaluation in January/February, 1991 to determine the impact of networks on research results.

A strategic plan for SAFGRAD III has been submitted to USAID and other donors. It will emphasize greater financial support to NARS and more long-term training. The evaluation will focus on the relevance of the research in the various networks to meet constraints of NARS.

SPAAR is being considered by USAID as another channel for financial support to agricultural research. USAID will prepare a Project Paper (PP) for SAFGRAD III with plans to begin the project in 1992.

An Oversight Committee Evaluation of networks was conducted in 1990 which will provide useful information to project design.

An extension of SAFGRAD II to the end of calendar year 1991 should be considered.

Budget

Mr. Vaidyanathan, WASIP-Mali Administrator, described ICRISAT procedures for financial accounting as it relates to travel advances of Network visitors to NARS and payment to NARS for research support.

The Coordinator presented the Network financial situation as of October 1990.

The Committee recommended that:

- a) Network support funds to NARS be increased. The Coordinator was asked to prepare a budget proposal to this effect;
- b) sufficient funds should be budgeted to extend Network operations to complete the 1991 calendar year, -i.e. September 1 - December 31, 1991;

- c) to support WASIP-Mali's request for financing of a hybrid seed production training course for training approximately 15 participants and a manual for hybrid seed production.

The Sasakawa Global 2000 representative advised that his organization may be able to provide some financial support, if requested. The hybrid production training course should be jointly sponsored by ICRISAT/SAFGRAD (Sorghum Network) and Global 2000.

Inter-Network Conference in 1991

A joint workshop of the sorghum, maize and cowpea networks will be held in Niamey, Niger in March 7-14, 1991. From 160 to 200 participants are expected. There will be 2 days of plenary session with approximately 20 invited scientific papers addressing the following themes:

1. State of the art in Crop Improvement over the last 5 years;
2. Research frontiers for the 1990's;
3. Networking as a regional strategy; and
4. On-farm research.

The 3 networks will meet in separate, concurrent sessions over the following 3 days.

There will be opening addresses by the Executive Secretary of OAU and the Niger Minister of Agriculture. The country papers will be published in a separate report. The networks will finance their own participants while SAFGRAD will finance invitees outside the networks and provide general logistical support.

The Coordinator agreed to write to request NARS who have not designated an official representative to do so and to remind the network researchers that they are encouraged to submit a scientific paper.

Regional Agronomy Trials

Dr. Salez, the CIRAD representative, proposed the establishment of regional trials to evaluate elite varieties. Suggested topics were:

1. To evaluate elite genotypes at different technological levels such as fertility level of N and P, land preparation methods, plant populations, etc.

2. Genotypes in sole versus intercropping trials. Information from research sites needed include rainfall and soil analysis. These trials should be conducted initially on-station but extended to on-farm sites by year 2 or 3.

In-service Training in Plant Protection

The Coordinator proposed a training program at WASIP-Mali in entomology, plant pathology and *Striga*. Estimated cost for one month of training was \$ 25,000. The Committee recommended having separate training courses for 3 participants of approximately 10 days in each of the 3 areas and a revision of the training budget. Suggested time period is September/October.

Participants were suggested to be selected from the following countries:

Striga: Nigeria, Chad, Gambia, Senegal, Burkina Faso;

Entomology: Niger, Ghana, Cameroon, Côte d'Ivoire;

Plant pathology: Burkina Faso, Benin, Senegal, Ghana.

Visits to NARS in 1990

Dr. Nwasike presented the results of his visit to Ghana and his recommendations for the Ghana national program. Dr. Thomas presented a similar report on visits to Chad, Nigeria and Niger.

Samanko Station Visit

The Committee members visited the ICRISAT/WASIP-Mali facilities and experimental fields on the morning of December 4.

IBPGR Report

Dr. Jane Toll, IBPGR Coordinator for West Africa from the IBPGR office in Niamey, Niger gave a presentation on the role of IBPGR in germplasm collection, evaluation and conservation in West and Central Africa. She drew attention to the importance the NARS give to having representative collections of local germplasm conserved, characterized, evaluated and documented as the basis of their breeding programs. She suggested that the existing research and improvement networks could play an important role in the exchange of germplasm, coordination of evaluation and centralization and exchange of data. A first step could be the building up of a

central data base on the region's sorghum germplasm based on the ICRISAT data base.

The Committee expressed a need for greater Network access to information on the germplasm collections made in the region. Dr. Toll was requested to present a position paper on the integration of genetic resources into the crop networks at the Inter-Network Conference at Niamey in March, 1991.

Global 2000 Report

Dr. Marcel Galiba described the organization and philosophy of Global 2000 and its agricultural development activities in support of small-scale farmers in Africa.

Global 2000 provides small-scale farmers the opportunity to test available technological packages. Nearly 100,000 farmers tested the technology in 1989 for maize and sorghum. Organizing farmers into groups, associations and cooperatives was a vital fact of Global 2000 activities. Following Ghana's experience, Global 2000 realized that production should be supported by other activities like seed production, storage, credit, marketing and processing. The 2nd phase of Sasakawa Global 2000 project in Ghana would tackle those so-called "2nd generation problems".

Meanwhile, programs had been opened in Benin (in 1989) and Togo (in 1990). Everywhere, farmers had seen their yields doubled, tripled, sometimes quadrupled when compared to national averages.

It is their wish that the WCASRN could help them to have improved cultivars. Many fields of collaboration are possible and they looked forward to having good working relationships.

Revised Network Support Budget for 1991

The Coordinator presented a budget proposal for the balance (\$ 87,000) of the Network Support line item to increase research support to NAR programs. The Committee agreed on the following allocation:

Lead Center Projects:	
Mali	\$ 8,000
Burkina Faso	\$ 8,000
Cameroon	\$ 8,000
Niger - Long smut	\$ 6,000
Niger - Cereal Quality	\$ 5,000
Nigeria	\$ 9,000

Subtotal	\$ 68,000

12 non-lead Center NARS: (\$ 2,000 each)
Subtotal \$ 24,000

WASIP-Nigeria F1 Seed
Production Training: \$ 12,000

Contingency \$ 7,000

TOTAL \$ 87,000.

MINUTES OF THE 9TH STEERING COMMITTEE MEETING OF THE
WEST AND CENTRAL AFRICA SORGHUM RESEARCH NETWORK (WCASRN)
NIAMEY, NIGER
MARCH 13 and 14, 1991

Participants

1. Y. NDjekoukosse	Chad	member
2. C.C. Nwasike	Nigeria	member
3. S. Da	Burkina Faso	member
4. R. Kenga	Cameroon	member
5. Y. Doumbia	Mali	member
6. M.D. Thomas	SAFGRAD/ICRISAT	member/Coordinator
7. O. Ajayi	ICRISAT-Kano	observer
8. J. Chantereau	CIRAD	observer
9. G. Trouche	CIRAD	observer

General

The Steering Committee meeting was held on March 13 and 14, 1991, during the SAFGRAD Inter-Network Conference. General matters related to the Network were reviewed. This was the first Steering Committee meeting after the election of new members. Nigeria and Mali were re-elected, and Senegal elected as a new member replacing Niger. Chad, Burkina Faso and Cameroon were not up for election.

M.D. Traoré, the current representative of Mali and Chairman of the Steering Committee expressed some doubts about his availability to serve as a member of the Committee and suggested that Mali should be represented by Y. Doumbia. Since Mr. Doumbia had not been officially appointed by his country, the Committee decided that he should serve as an observer until further clarification from Mali. In case M. Traoré would not be available, Sansan Da would take over as Chairman of the Committee. The Director of Research in Senegal should appoint a representative to the Steering Committee. SAFGRAD Office in Ouagadougou would contact Senegal in this regard.

The agenda of the meeting was accepted and R. Kenga was designated as rapporteur of the session.

Coordinator's Remarks

He first thanked all the Steering Committee members for the good collaboration he received from them. The first draft of the budget was submitted to the administration of ICRISAT/WASIP-Mali in Bamako for review. No copy of the current budget was available but will be sent to members as soon as possible.

Budget

USAID funding officially ends in 31 August, 1991. USAID requested ICRISAT to prepare a short budget which will cover the cropping season up to 31 December, 1991. If the SAFGRAD evaluation coming up in April or May gives positive results, USAID may extend the budget up to 1992.

1991 Program

- a) Working Group Meetings: The plant protection working groups and the utilization working group will meet before the end of the year. The idea is to have these projects evaluated before phase 2 comes to an end. All projects will have to include in their report the full or partial 1991 data, so that the Coordinator could write a general report based on three years' data. The meeting will be held in November in Kano.

The *Striga* working group recommendations were received and approved. The Coordinator should take action.

- b) Visits to NARS, 1991 regional trials, multilocation trials, and plant protection in-service training proposals were approved. They had been discussed in the plenary session and no modifications were made by the Committee.
- c) Agronomy Trials: Mr. Salez should refine the project and write a final proposal.
- d) Steering Committee Meeting: The Steering Committee should meet to evaluate the recommendations of the working groups. Both the Steering Committee and the Working Groups will meet during the same period. In case of lack of funds, only the Chairman of the working groups will be invited to the meeting. Dr. Ajayi, suggested that the joint meeting be held at Kano, Nigeria on November 11 - 14, 1991.

Closing remarks

The Chairman thanked the Coordinator for a job well done and wished all participants a safe journey back home.

A N N E X 2

RECOMMENDATIONS OF THE REGIONAL WORKSHOP

USAID/SAFGRAD/OAU-STRC/ICRISAT

WEST AND CENTRAL AFRICA SORGHUM RESEARCH NETWORK (WCASRN)

SAFGRAD INTER-NETWORK CONFERENCE

7 - 14 March, NIAMEY, NIGER

RECOMMENDATIONS OF THE SORGHUM NETWORK

W C A S R N

International Crops Research Institute for the Semi-Arid Tropics

ICRISAT

B.P. 320, Bamako, MALI

MAY 1991

RECOMMENDATIONS - AGRONOMY GROUP

1. Considering that intensification of sorghum production consists of the use of fertilizer, promising varieties, and cropping techniques, it is recommended:

- that agronomic trials be conducted in SAFGRAD member countries in order to assess the response of varieties selected by the Network:
 - a) intensification:
 - . fertilization
 - . soil work
 - b) intercropping with a leguminous (groundnut or cowpea) according to sites.

This program will take into account ecological conditions of each site (rainfall, physico-chemical characteristics of soils).

2. Considering the difficulties of some national programs (logistics, financial, personnel, etc.) to conduct on-farm trials, it is recommended:

- a) that the two types of trials be first conducted as on-station trials and not as on-farm trials for the reasons mentioned above;
- b) that the promising results obtained be transferred to farmers' fields as on-farm trials.

Members of the Agronomy Recommendation Group

- P. Salez
- D. Sogodogo
- J.M. Kafara
- S. R'chid

RECOMMENDATIONS - SORGHUM BREEDING GROUP

1. The *Striga* problem:

- Considering that *Striga* causes a general problem as per country reports and scientific communications;
- Given the absence of a specific approach to solve the problem;

it is recommended that the selection of resistant cultivars be followed within a multidisciplinary framework involving all disciplines in order to contribute to a better the understanding of the *Striga* and to help find solutions.

2. Drought stress

- Considering that the long maturing cycle of many varieties make them susceptible to the unstable rainfall prevailing in the sub-region;
- Acknowledging that early maturity varieties an alternate solution, but not necessarily an expression of resistance to drought;

it is recommended that screening for tolerance to drought stress be emphasized taking into consideration earliness as one of the short and medium term solutions.

3. Place of local varieties

- Considering that the local varieties are well adapted to their sites though the yield is not always of the best;
- Considering that introduced varieties are sometimes rejected by our farmers although they present good agronomic potentials;
- Considering the necessity for research to produce suitable materials to farmers;

it is recommended that an exhaustive assessment of local varieties and their use in breeding programs be carried out.

Members of the Breeding Recommendation Group

- S. Da
- I. Kapran
- F. Assamoi
- C. Luce

PLANT PROTECTION

From the scientific communications and country reports, it was noted that stem borers, head bugs, midges, anthracnose, long and covered smuts, grain mold and *Striga* constitute the most important biotic stresses limiting sorghum production in the West and Central African subregion. SAFGRAD has made commendable effort to ameliorate these problems. It is further recommended as follows:

- 1) that breeders should work closely with plant protectionists so that materials should, prior to release, be screened for their reaction to the important plant protection problems. Also varieties for exchange or screening should be accompanied by all available details on their plant protection characteristics (i.e. resistance status).
- 2) that plant protectionists should evaluate the six promising varieties (identified by SAFGRAD) for their reaction to the major insect pests, diseases and *Striga* under the support of SAFGRAD.
3. that, besides tests on resistance, SAFGRAD should support research on other methods of *Striga*, insect pest and disease control (e.g. chemical and cultural) with a view to developing integrated control strategies.
4. that SAFGRAD should expand its program of lead centers for specific plant protection problems to include all the major plant protection problems identified at this workshop (as listed above).

Members of the Plant Protection Recommendation Group

- I.I. Uvah
- A. Neya
- Y. Kollo
- A.G.T. Babiker

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Members of the Breeding Recommendation Group

- S. Da
- I. Kapran
- F. Assamoi
- C. Luce

SORGHUM UTILIZATION GROUP

PREAMBULE: Sorghum is becoming increasingly popular both for local and industrial uses. However the grain quality of sorghum is essential in determining the type of food product(s) that can be properly prepared from such foods. Thus, the following recommendations are being made for enhancing the utilization of sorghum grains for specific purposes.

1. Grain quality

- Considering the importance of sorghum in domestic as well as industrial use;
- Considering that many improved varieties are susceptible to various panicle insects and pathogens, and therefore do not always suit users and consumers' needs;
- Noting that in many cases, selection criteria do not match food quality and yield data;

the Sorghum sub-group recommend:

- that consumer needs be effectively taken into account;
- that improvement of food quality and diversity of finished products of improved sorghum varieties be emphasized.

It is further recommended that:

1. Breeders and agronomists should have at the back of their mind, grain quality attributes desired by consumers and not to concentrate mainly on yield and other production factors;
2. Sorghum grains for brewing should have low levels of protein, high levels of starch, high alpha and both anlyse, and starch gelatinization temperature not greater than 65°C;
3. Sorghum grains for infant and breakfast cereals should possess yellow endosperm, high levels of protein and starch, low levels of tannin and high protein digestibility;
4. For baked products, it is desirable to have grains with floury endosperm, high levels of starch and lysine, low levels of both analyses and low concentration of oil;
5. The various local foods prepared from sorghum reauire grains with floury endosperm, low level of tannin and high protein digestibility;

~~Sorghum~~ varieties with good popping characteristics should be identified and the grain characteristics required for high popping efficiency identified and incorporated into varieties having good agronomic traits as well as resistance to pests and diseases.

Members of the Sorghum Utilization Group

- R.E. Aluko
- S.S. Buah
- C.C. Nwasike

GENERAL

The following are general recommendations:

1. In view of the cardinal importance of documentation in research, it is recommended that SAFGRAD should, if it has not yet done so, create a standard logbook which should, in duplicate, accompany all genetic material to be tested. The logbook should include information on all known characteristics as well as space for documentation of those to be tested.
2. In view of the need for development of standard research methodology to facilitate comparison and compatibility of research results across the sub-region, it is recommended that SAFGRAD should arrange a meeting of top scientists from each discipline to develop standard evaluation procedures.
3. It is recommended that inter-regional cooperation in matters of research and training should be intensified to enhance efficiency of resource utilization.
4. Finally, it is recommended that SAFGRAD should increase its general support to NARS for research and training.

General recommendations were coordinated by S. Da.

ANNEX
3
LIST OF VARIETIES AND THEIR ORIGIN
1990 TRIALS

WASVAT - Cycle Precoce/Early

1990

No. d'entree Entry no.	Variete Variety	Programme d'origine Originating program
1	CS 54	Cameroun
2	CS 61	Cameroun
3	CE 151-382	Senegal
4	CE 196-7-2-1	Senegal
5	Nabana Beida	Mauritania
6	Lekwere Bedha	Mauritania
7	ICSV 242 IN	ICRISAT Reg/Nigeria
8	ICSV 258 IN	"
9	ICSV 401 IN	"
10	ICSV 1079 BF	ICRISAT/Reg/Mali
11	ICSV 1170 BF	"
12	ICSV 1177 BF	"
13	ICSV 1172 BF	"
14	ICSV 1174 BF	"
15	ICSV 1125 BF	"
16	ICSV 1175 BF	"
17	ICSV 1176 BF	"
18	Nagawhite (Control/temoin)	Ghana
19	ICSV 111 IN (")	ICRISAT
20	Local(e) (")	Programe National

WASVAT - Cycle Medium/Moyen

1990

No. d'entree Entry no.	Variete Variety	Programme d'origine Originating program
1	CS 95	Cameroun
2	CS 85	Cameroun
3	NSV-1	Ghana
4	SEPON-82	Niger
5	F ₂ -20	Senegal
6	Takmalit	Mauritania
7	Niobougou	Mauritania
8	BF 80-10/6-2-3	Burkina Faso
9	BF 82-3/25-1-1	Burkina Faso
10	BF 82-4/4-1-1	Burkina Faso
11	IS 6928	ICRISAT Reg/Nigeria
12	IS 23526	"
13	IS 22380	"
14	ICSV 1163 BF	ICRISAT Reg/Mali
15	ICSV 1157 BF	"
16	ICSV 1171 BF	"
17	Blanc de Karimama	Benin
18	ICSV 1063 BF(Control/temoin)	ICRISAT
19	ICSV 1089 BF(")	ICRISAT
20	Local(e) (")	Programme National

WEST AFRICAN SORGHUM HYBRID ADAPTATION TRIAL
(WASHAT) - 1990

LIST OF ENTRIES

ENTRY	DESIGNATION	ORIGIN/PEDIGREE
1	ICSH 780	ICSA 11 x MR 908
2	ICSH 89001 NG	ICSA 11 x ICSV 247
3	ICSH 88038	ICSA 37 x MR 864
4	ICSH 89005 NG	ICSA 37 x MR 904
5	ICSH 89006 NG	ICSA 37 x ICSV 247
6	ICSH 507	ICSA 38 x MR 926
7	ICSH 89002 NG	ICSA 38 x ICSV 247
8	ICSH 89007 NG	ICSA 38 x MR 917
9	ICSH 89008 NG	ICSA 38 x MR 912
10	ICSH 89009 NG	ICSA 39 x MR 906
11	ICSH 89010 NG	ICSA 39 x MR 908
12	ICSH 89011 NG	ICSA 39 x MR 912
13	ICSH 89012 NG	ICSA 39 x MR 917
14	ICSH 89013 NG	ICSA 39 x MR 941
15	ICSH 89004 NG	ICSA 41 x MR 841
16	ICSH 89014 NG	ICSA 41 x ICSV 247
17	INRAN Sorghum Hybrid	Tx 623A x MR 732
18	INRAN Sorghum Hybrid	Tx 631A x Suc 36
19	ICSV 111	Early Maturing Variety Control
20	Local	Early Maturing/Variety/Hybrid Control

STRIGA TRIAL - 1990

Entree	Cultivar	Pedigree	Source
1	ICSV 1078 BF	(FramidaxE 35-1)-4-2-13	ICRISAT
2	ICSV 1079 BF	(Framida x E 35-1)-4-2-15	ICRISAT
3	ICSV 1007 BF(SRN 39)	CSV 5 x Framida	NIGER
4	ICSV 1098 BF	(ICSV 1011 BF x CSV 4)-2-2	ICRISAT
5	ICSV 1112 BF	(ICSV 1004 BF x ISVAT 82/ 2022)-3-2	ICRISAT
6	ICSV 1115 BF	(Framida x E 35-1)-3-7	ICRISAT
7	ICSV 1156 BF	(Framida x E 35-1)-4-2-37	ICRISAT
8	ICSV 1164 BF	(ICSV 1011 BF x CSV 4)-2-8	ICRISAT
9	HV 80-10/23-2-1		IRAT/BF
10	IS 9830	-	ICRISAT
11	ICSV 1001 BF	Framida	ICRISAT
12	Temoin	Variete locale	Prog Nation.

PEPINIERE OUEST-AFRICAINNE DES MALADIES FOLIAIRES DU SORGHO
 WEST AFRICAN SORGHUM LEAF DISEASE NURSERY
 (WASLDN - 1990)

No d'entree Entry no	Genotype Genotype
1	84 S 82
2	84 S 85
3	84 S 103-1
4	84 S 103-2
5	84 S 109
6	84 S 115
7	84 S 126
8	84 S 130
9	84 S 157
10	ICSV 1002 BF
11	84 W 838
12	84 W 848
13	84 W 852
14	ICSV 2 IN
15	ICSV 85.BF
16	ICSV 1011 BF
17	ICSV 1023 BF
18	IS 956
19	IS 3443
20	IS 3555
21	IS 6991
22	IS 9225
23	ICSV 1034 BF
24	ICSV 16-5 BF
25	IS 18696

1. All genotypes are from ICRISAT breeding programs, except for the IS lines which are from ICRISAT's germplasm collection.

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Department of Rural Economy and Agriculture (DREA)

African Union Specialized Technical Office on Research and Development

1991-05

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