

USAID/SAFGRAD/OAU-STRC/ICRISAT

West and Central Africa Sorghum Research Network
(WCASRN)

BASIC INFORMATION

International Crops Research Institute for the
Semi-Arid Tropics (ICRISAT)

West African Sorghum Improvement Program
(WASIP)

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USAID/SAFGRAD/OAU-STRC/ICRISAT
WEST AND CENTRAL AFRICA SORGHUM RESEARCH NETWORK¹

BASIC INFORMATION

I. BACKGROUND

The first regional workshop sponsored by ICRISAT/SAFGRAD/USAID was held in Ouagadougou, Burkina Faso from 27-30 November, 1984. During that workshop, representatives from the National Agricultural Research Systems (NARS) requested ICRISAT to coordinate the network activities. It was attended by a total of 46 participants from 16 countries. There were also representatives from ICRISAT, IRAT, INSAH/CILSS, and SADCC/ICRISAT. The idea of a regional approach to sorghum improvement was discussed and approved. The West Africa Sorghum Research Network became operational in 1985 when a Steering Committee was formed. The Committee consisted of representatives from NARS as members and of representatives from several regional organizations as observers.

Phase II of the West and Central Africa Sorghum Research Network (WCASRN) started in September 1, 1986 and will end in August 31, 1991. The United States Agency for International Development (USAID), through the Semi-Arid Food Grain Research and Development (SAFGRAD) a component of the Scientific Technical and Research Commission (STRC) of the Organization of African Unity (OAU), provided a grant of 3.1 million dollars for phase II of WCASRN. This grant was sub-contracted to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) whose West African Sorghum Improvement Program in Mali (WASIP-Mali) executes the project, with the provision of a Coordinator. The execution of the project by ICRISAT was carried out from Ouagadougou up to June 1988 when the Sorghum Program was re-organized and moved to Bamako as WASIP-Mali.

II. OBJECTIVES, PURPOSE AND RATIONALE

In the semi-arid ecology of West and Central Africa, sorghum is an important crop in the diet of the population and can be regarded as the staple food in several countries. Most of the sorghum is grown in the Sudanian Zone (500 - 1000 mm rainfall) and the Northern Guinean Zone (1000 - 1200 mm rainfall). Some sorghum is also grown in the Southern Sahelian Zone (400 - 500 mm rainfall). Along with pearl millet (*Pennisetum americana* (L) Leake), sorghum provides the main energy source for the people of the Sudanian and Northern Guinean Zones, and is probably the most important food crop in Semi-Arid West Africa. The 17 member countries of WCASRN, their corresponding area harvested, yield and production figures for sorghum are given in Table 1.

The purpose of the USAID grant was to address the sorghum improvement problems of West Africa by concentrating on problems and constraints having regional significance, and by establishing the necessary links with national, regional and international institutes to serve the entire region effectively. The objectives of the Network are:

- a) 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;
- b) To assist and strengthen national sorghum improvement programs, and contribute to their research needs in all agroecological semi-arid zones;
- c) To develop improved varieties and hybrids and agronomic/management practices capable of giving higher and more stable economic yields in the semi-arid environments;
- d) To organize and promote systematic regional testing of available and improved genetic material and technology in the semi-arid zone;
- e) To facilitate the development of agricultural research manpower among West Africa nationals at all levels; and
- f) To organize regional workshops and monitor uniform yield trials through field inspections.

III. NETWORK PROGRAM AND IMPLEMENTATION STRATEGY

The main activities of the Network are as follows:

- Training
- Regional trials and nurseries
- Research projects
- Monitoring tours
- Regional workshops
- Visits to NARS.

Administrative and technical support are given by WASIP-Mali, except for hybrid production which is carried out by WASIP-Nigeria. Prior to June 1989, the Coordinator was also the Team Leader of WASIP-Mali. At present ICRISAT provides a Coordinator who is the Pathologist in the WASIP-Mali team. The Coordinator implements the decision of the Steering Committee which meets on the average twice a year, and is the driving force behind the Network. The Coordinator carries out the day-to-day activities of the Network by making use of all levels of technical and administrative staff of WASIP-Mali.

Only the Coordinator, a bilingual secretary and a driver are paid from the Network funds. The Coordinator reports to the Executive Director of ICRISAT Sahelian Center (ISC) in Niamey and is in close consultation with the Team Leader of WASIP-Mali. Direct links exist between the Coordinator and SAFGRAD Coordinating Office (SCO) in Ouagadougou.

Yearly progress reports are prepared by the Coordinator and submitted to USAID, Ouagadougou through the Executive Director. The Coordinator disburses funds for the activities of the Network and financial reports are prepared on a monthly basis by WASIP-Mali accounts section. These financial reports are sent directly to ICRISAT Center (IC) in Hyderabad, India which has the responsibility to submit them to USAID in Ouagadougou.

Major recommendations are made by representatives from NARS at regional workshops which are held every two years. Members of the Steering Committee are also elected at these workshops. The present Steering Committee consists of representatives from six member countries and the Coordinator as follows:

M.D. Traoré	- Mali (Chairman)
S. Da	- Burkina Faso
O.P. Dangi	- Cameroon
J.W. Clark	- Niger
O. Nwasike	- Nigeria
Y. Djekoukousse	- Chad
M.D. Thomas	- Coordinator.

Representatives from SAFGRAD, USAID, INSAH and IRAT regularly attend as observers. The Steering Committee recently decided that the Team Leaders of both WASIP-Mali and WASIP-Nigeria should always be invited to attend as observers. Global 2000 has recently been invited as an observer.

IV. SUMMARY OF ACHIEVEMENTS

TRAINING

Striga Training Workshop

The first training workshop was on *Striga* control and was held in Ouagadougou, Burkina Faso, from 5 to 10 October, 1987. There were 12 participants from the following 11 countries: Burkina Faso, Cameroon, Gambia, Ghana, Kenya, Mali, Niger, Nigeria, Sudan, Togo, and Uganda. Two participants came from Uganda. In addition to ICRISAT scientists, specialists from IRAT, Sudan, and Old Dominion University assisted in the training.

Training Workshop on Agronomic Research and On-Farm Testing

This workshop was held in Bamako, Mali between 9 and 29 September, 1989. Nine out of ten countries invited were represented. The representative from Central African Republic was absent. The countries invited were Central African Republic, Côte d'Ivoire, Gambia, Ghana, Guinea Bissau, Mauritania, Niger, Nigeria, Senegal, and Sierra Leone. There was a total of 11 lectures and five field visits. Lecture topics ranged from soil fertility, control approaches to *Striga*, and crop and animal interaction to principles of on-farm testing. Field visits included a trip to the Cinzana research station some 270 km from Bamako, the national program at the Sotuba station just outside Bamako, a special *Striga* field trip to Katibougou, about 70 km north of Bamako, and trials of ICRISAT's West African Sorghum Improvement Program (WASIP) at the new site at Samanko, 18 km from Bamako.

REGIONAL TRIALS AND NURSERIES

1986

The West African Sorghum Adaptation Trials were organized by the SAFGRAD/ICRISAT West African Sorghum Improvement Program, as per the recommendations of the Steering Committee of WCASRN.

During 1986, three regional trials were organized. These were the West African Sorghum Variety Adaptation Trial early and medium duration varieties (WASVAT-Early and Medium) and the West African Sorghum Hybrid Adaptation Trial (WASHAT). The variety trials comprised of 20 entries each while the hybrid trial comprised of 36 entries; including controls. The regional trials comprised of elite breeding lines and hybrids contributed by ICRISAT and the National Sorghum Programs of Burkina Faso and Mali. The entries included in the trials were mostly of recent origin and represented promising lines from various breeding programs. Cooperators in the national programs were expected to select useful entries from these trials for further testing and advancement in their countries.

Seeds of WASVAT-Early were dispatched to cooperators in nine countries. Results were received from seven locations in five countries. In general, results from five locations were satisfactory and were included in the statistical analysis. Across the five locations, ICSV 1078 BF was the highest yielder followed by the entries ICSV 1054 BF, ICSH-1 and ICSV 1055 BF. The local control varieties yielded low at all the locations except Guiring, Cameroon where the improved control variety S-35 yielded the highest (6.84 t ha⁻¹). Examination of ranks across locations indicated that ICSH-1, ICSV 1078 BF, ICSV 1054 and ICSV 16-5 obtained high ranks consistently. The lowest mean yield for all the locations was 2.45 t ha⁻¹.

Seeds of WASVAT-Medium were supplied to cooperators at twelve locations. Results were received from eight locations. However, grain yield data from two locations were not subjected to statistical analysis because of high coefficient of variation. Overall, the hybrid control ICSH-1 exhibited the highest yield (2.59 t ha^{-1}) across locations and was the most stable. Among the test entries, ICSV 1063 BF and IS 915 were the highest yielders.

Seeds of WASHAT were distributed to cooperators located in eight countries. The trial was planted at 15 locations. However, the experiments failed at three locations : Niangoloko (Burkina Faso), Sotuba (Mali) and Maradi (Niger), due to extremely late planting in poor fields. Grain yield data was received from 12 locations.

At the location Guirring, grain yields of individual entries were as high as 6.37 t ha^{-1} and were out of the range. Overall mean grain yields over nine locations showed that ICSH 230 ranked first (3.36 t ha^{-1}) followed by ICSH 229 (3.34 t ha^{-1}), ICSH 208 (3.24 t ha^{-1}). The mean yields ranged from 2.24 t ha^{-1} to 3.36 t ha^{-1} . Other top yielding hybrids were ICSH 134 and ICSH 208.

1987

Three regional sorghum adaptation trials were conducted. WASVAT-Early and Medium had 20 entries each. Seeds for WASVAT Early and Medium were sent to 10 and 14 countries, respectively. The third trial was WASHAT which had 25 entries and was sent to seven countries. These trials were conducted for the second consecutive year and the entries were elite varieties and hybrids furnished by ICRISAT and by the national programs of Burkina Faso, Cameroon, Ghana, Mali, Niger and Senegal. Most of the entries in the WASVATs were tested for the first time, whereas the others represent the best entries from 1986. Results for 1987 were obtained from 9, 12, and 15 locations for WASVAT-Early, WASVAT-Medium, and WASHAT, respectively.

Because of high coefficient of variation, only data from 7 locations for both the WASVATs and from 10 locations for WASHAT were analyzed. For WASVAT-Early, the variety Nagawhite had the highest mean yield (2.80 t ha^{-1}) for all seven locations; and for WASVAT-Medium, it was ICSV 1063 BF with a mean yield of 2.58 t ha^{-1} . For WASHAT, ICSH 336 had the highest mean yield (2.80 t ha^{-1}) for all ten locations.

The West African Sorghum Disease Resistance Nursery (WASDRN) was sent for the first time in 1987 to five countries and was grown in six locations. The nursery had 36 entries of which 20 were promising genotypes observed for resistance to leaf diseases in preliminary observation nurseries of ICRISAT's Burkina Faso Pathology program since 1985. They originated from ICRISAT's breeding program in Burkina Faso. Thirteen of these lines were agronomically promising germplasm lines and the remaining three

were susceptible controls. Results received from five locations indicate that six genotypes, 84 W 19, 84 W 848, ICSV 85-4, ICSV 1034 BF, IS 9928, and IS 21658 had low severity scores, 3.5 or less, for the prevalent leaf diseases in all locations.

1988

WASVAT-Early duration consisted of 20 entries and 14 sets were sent to seven countries. The 20 varieties were the same as for 1987. Results were received from 10 locations. The variety Nagawhite had the highest mean yield (3.53 t ha^{-1}) of all 10 locations.

WASVAT-Medium duration also consisted of the same 20 entries as in 1987, and 19 sets were sent to 15 countries. Results were received from 11 locations. The coefficients of variation were higher than 40% for five locations. The variety ICSV 1063 BF had the highest mean yield (3.34 t ha^{-1}) of all six locations.

West African Sorghum Hybrid Adaptation Trial (WASHAT) consisted of 20 entries and was grown at 12 locations in seven countries. The hybrids ICSH 507 ranked first for mean yield (3.31 t ha^{-1}) of all seven locations, and exhibited consistent performance across locations.

West African Sorghum Disease Resistance Nursery (WASDRN). This nursery contained the same 36 entries as in 1987 and was grown at seven locations in six countries. The objective of WASDRN is to identify stable resistance to the important leaf diseases of sorghum in West Africa. The leaf diseases, leaf anthracnose (*Colletotrichum graminicola*), sooty stripe (*Ramulispora sorghi*) and gray leaf spot (*Cercospora sorghi*) are important in West Africa. Three genotypes, 84 S 82, 84 S 103-3, and 84 S 130, had low levels of infection to these three leaf diseases at all seven locations. Sooty stripe severity was very low, disease score of 3 or less in a 1-6 scale, at all locations except Bengou in Niger. Disease severity did not exceed 3.0 for any disease for all 36 genotypes in Ghana.

The West African Sorghum *Striga* Trial (WASST) was organized for the first time at the request of several national programs. The trial consisted of 11 entries which had been tested by ICRISAT in fields with high *Striga* infestation and one local control. The trial was sent to Cameroon, Ghana, Mali, Niger, Nigeria, and Togo, and results were received from Cameroon, Ghana, and Mali. The results showed that IS 9830 and ICSV 1007 BF are promising lines for *Striga* resistance.

1989

WASVAT-Early duration consisted of 20 entries. The entries included varieties from the national programs of Mauritania, Cameroon, Senegal, Ghana and from WASIP. Sixteen sets of this trial were sent

to 12 countries. Results with relatively low coefficient of variation were received from 10 locations in seven countries. The variety ICSV 1079 BF had the highest mean yield (2.74 t ha^{-1}) of all 10 locations. WASVAT-Medium duration also had 20 entries and included varieties from the national programs of Cameroon, Niger, Ghana, Burkina Faso, Senegal, Benin, Mauritania and from WASIP. Nineteen sets were sent to 16 countries and results with low coefficient of variation were obtained from nine sites in seven countries. The variety ICSV 1171 BF had the highest mean yield of 2.46 t ha^{-1} of all seven locations.

WASHAT was grown at nine locations in six countries and consisted of 20 entries from Nigeria, Niger, and ICRISAT. Results were received from eight locations in six countries. ICSH 507 exhibited the highest mean yield of 3.66 t ha^{-1} of all eight locations.

The West African Sorghum Leaf Disease Nursery (WASDLN). Although 10 sets of this nursery were sent to nine countries, results were obtained from only two countries. The 25 entries in this nursery were scored for gray leaf spot and leaf anthracnose at both locations. Twenty-two of the 25 entries and all 25 entries had mean scores of 3.0 or less on a 1-6 scale, for leaf anthracnose and gray leaf spot, respectively, at both locations. The more resistant lines for both diseases included 84 S 82, 84 S 130, 84 S 103-2, and IS 3443.

The *Striga* trial was sent to nine countries and results were received from six countries. Promising lines for *Striga* included ICSV 1001 BF, ICSV 1007 BF, ICSV 1164 BF, and IS 9830.

1990

The trials for 1990, the countries they were sent to, and the number of sets sent to each country are given in Table 2.

At the fifth Steering Committee of WCASRN in May 1989, it was recommended that national programs should be asked to closely evaluate certain varieties that have shown some promise over the years. A technical information sheet for this purpose was prepared. These varieties are ICSV 1063 BF, CE 180-33, ICSV 111 IN, ICSV 1083 BF and Malisor 84-1.

COLLABORATIVE RESEARCH PROJECTS WITH NATIONAL AGRICULTURAL RESEARCH SYSTEMS

The West and Central Africa Sorghum Research Network initiated four research projects in four NARS in June 1989. These projects are leaf anthracnose (*Colletotrichum graminicola*) in Burkina Faso, long smut (*Tolyposporium ehrenbergii*) in Niger, head bug (*Eurystylus*

sp.) in Mali and technology of wheat-sorghum composite flour in Nigeria.

The main objectives of the anthracnose project are to determine whether pathotypes of the pathogen occur in Burkina Faso and to identify genotypes resistant to the pathotypes. The objective of the long smut project in Niger is to develop a simple and effective inoculation method for use in screening techniques. The project on head bug in Mali emphasizes among other things, the biology of the insect, its economic importance, and identification of resistant sources. In Nigeria, the project scientists hope to develop a technology for producing acceptable wheat-sorghum composite flour for bread and confectionery, aimed at increasing the sorghum component as high as possible.

A project on identification of *Striga* resistant lines will start in 1990 by the Cameroon national program. Each of these projects will receive \$ 5,000 per year for two years.

Progress of the Projects

A working group meeting on the research projects on leaf anthracnose (Burkina Faso), long smut (Niger), and head bugs (Mali) was held in Bamako between April 19 and 20. Results of the first years' work were presented and future plans were discussed. The principal investigators, evaluators from the national programs of Burkina Faso, Niger, and Mali, and resource persons from ICRISAT's Regional Program and FAO in Mali participated.

Using the spreader row technique, the project in Burkina Faso screened a total of 80 sorghum lines, of which 56 were local varieties and 24 were introduced genotypes. Seventy-four out of the 80 lines tested were resistant (mean score of 3 or less in a 1-6 scale) to the foliar stage of the disease. Of the six susceptible lines, four were introduced genotypes. Only one introduced genotype was susceptible to stem infection.

Grains of thirty out of the 80 lines were free of the fungus. The level of grain contamination by *C. graminicola* was higher in introduced genotypes. In addition to confirming these first year results, work on the variability of the pathogen will be undertaken during the second year.

Results from the project on head bugs in Mali indicated that the population of *Eurystylus marginatus* was more abundant towards the end of September and October. Early planting resulted in no attack by *E. marginatus*, whereas two generations of the insect developed in late planted sorghums. In a screening experiment 100 lines were in an international nursery. There were also two trials with 20 and 25 varieties on resistance and an advance trial with 25 entries. A limited survey in farmers' fields revealed that in certain localities, *E. marginatus* attack was higher in introduced

lines than in locals. However, the level of attack depended on the locality and some local varieties were severely attacked in some localities. Work will continue on these aspects of the project during the second year.

The project on long smut in Niger encountered problems with flooding in the field due to high rainfall. In addition, attempts on artificial inoculation were unsuccessful.

A working group meeting on the project in Nigeria is planned for September 13 or 14 at the Institute of Agricultural Research in Zaria. Reports on these working group meetings will be prepared.

New forms for project description, project progress reports, financial reports, and project evaluation are now available. It should be mentioned that the financial reports received from Burkina Faso and Mali during the working group meeting were quite satisfactory.

MONITORING TOURS

1986

A group of national scientists from Benin, Central African Republic, Gambia, Mauritania, Nigeria and Senegal visited national programs in Cameroon, Gambia, Nigeria and Senegal from 23 September to 6 October, 1986. The visiting national scientists were able to exchange views on the sorghum production problems, and the on-going research programs in the countries visited.

The scientists from the national programs of Ghana, Guinea Bissau, Mali, Niger and Sierra Leone visited the research stations located at Kamboinsé, Saria and Farako-Ba in Burkina Faso during 13-16 October 1986 to observe breeding material, experimental varieties and hybrids, and male steriles and to select material of interest to them.

1987

Representatives from the national programs of Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Gambia, Niger, Nigeria, Senegal, Togo and Mali visited Burkina Faso. The participants monitored sorghum research activities in the national program, and the on-going ICRISAT's research work.

1988

A monitoring tour was organized between 9-18 October, 1989 in which representatives of Benin, Burkina Faso, Cameroon, Guinea, Mali, Chad and Togo visited Mali, Burkina Faso and Niger. They visited national, regional and international trials and nurseries at

Sotuba, Samanko and Cinzana in Mali, Farako-Ba and Saria in Burkina Faso, and Lossa, Tillabery and Maradi in Niger.

STEERING COMMITTEE MEETINGS

The first meeting of the Steering Committee of WCASRN took place in Ouagadougou between 13 and 14 January 1986. The following terms of reference for the Steering Committee were agreed upon :

1. the Steering Committee will play a key role in guiding the network activities.
2. The Steering Committee will monitor the execution of recommendations adopted by the general assembly in the workshops.
3. The Steering Committee will propose for discussion at the regional workshops new themes/ideas of interest to the network and related plan of action.
4. The Steering Committee, through the network Coordinator, will send a report of its decisions to all the members of the network. This report will be a subject of discussion in the workshop.

Other important matters discussed at that meeting were the recommendations adopted at the first and second regional workshop, identification of priorities, mechanics and plan of action for the Network and group travel of researchers from NARS.

The second Steering Committee meeting was held in Ouagadougou between 10 and 11 March, 1987.

The third Steering Committee meeting was held in Ouagadougou between December 15 and 17, 1987. The main objective of the meeting was to discuss practical means to strengthen national programs and to seek supplemental financial assistance.

The fourth meeting of the Steering Committee was held in Maroua, Cameroon on September 24, 1988, after the third regional workshop. An important decision at the meeting was that in view of inadequate funds to network support, and the need to support weaker national programs, the Coordinator was requested to explore the possibility of transferring funds from under-utilized line items to network support line item.

The fifth Steering Committee meeting was held in Bamako, Mali between May 9 and 11, 1989. The Committee elected Dr. M. Traoré as the new chairman to replace C.E. Ohiagu, who had left the services of IAR, Samaru. The Committee decided to invite Chad to replace Senegal as member and to invite Glaobal 2000 to become an observer.

The sixth Steering Committee meeting was held in Ouagadougou, Burkina Faso, between November 14-17, 1989. The Committee spent most of its time discussing the development of the long-term strategic plan for phase III of the Network.

The seventh Steering Committee meeting was held between 2 and 4 May, 1990 in Niamey, Niger. Members and observers of the current Steering Committee are as follows:

Burkina Faso	S. Da	member
Cameroon	O.P. Dangi	member
Chad	D. Yagoua	member
Mali	M.D. Traoré	member (Chairman)
Niger	J.W. Clark	member
Nigeria	C.C. Nwasike	member
ICRISAT	M.D. Thomas	member (Coordinator)
SAFGRAD	T. Bezuneh	Regular observer
USAID	G. Kingma	Regular observer
Glaobal 2000	A representative	observer
INSAH/CILSS	A representative	observer
IRAT/CIRAD	A representative	observer.

The Steering Committee decided to invite INTSORMIL and the Team Leaders of ICRISAT's West African Sorghum Improvement Programs (WASIP) in Kano, Nigeria and in Bamako, Mali, as observers.

Major points dicussed at the seventh Steering Committee meeting included results of the 1989 regional trials, collaborative research projects, the budget, and some future activities of the Network. In keeping with the philosophy of the Network that stronger NARS should help weaker ones, the Committee agreed that during the 1990 crop season, S. Da would visit Togo and Benin, C.C. Nwasike would visit Ghana, and O.P. Dangi Chad and Central African Republic. Another important decision was that WCASRN would hold its fourth regional workshop jointly with the two other commodity Networks (Cowpea and Maize) on 8 to 15 March, 1991 in Niamey, Niger. Other decisions were:

1. that the collaborative project from Cameroon on *Striga* be accepted on the condition that the work involved, identitification of resistant lines with a view to develop a regional *Striga* nursery;
2. a joint agronomy workshop for all three commodity networks;
3. that WCASRN invites representatives from some NARS to attend, at the expense of the Networks, the sorghum utilization conference in Bamako, Mali in November 1990.

REGIONAL WORKSHOPS

The first regional sorghum workshop was held in Ouagadougou, Burkina Faso from 27-30 November, 1984. In this workshop, the NARS requested ICRISAT to coordinate the network activities. It was attended by a total of 46 participants from 16 countries. There were also representatives from ICRISAT Center, IRAT, INSAH/CILSS, and SADCC/ICRISAT.

The second regional workshop was held in Bamako, Mali from 21-24 October, 1985. This workshop was attended by 47 scientists from 15 countries. Representatives from ICRISAT Center, IRAT, INSAH/CILSS, SAFGRAD, INTSORMIL, and TROP SOIL also attended. During this workshop, a Steering Committee was formed to help the network. Several recommendations were made.

The third regional workshop was held in Maroua, Cameroon from 20-23 September, 1988. It was attended by 52 participants from 14 countries. It was also attended by representatives from IRAT, ICRISAT Center, and SAFGRAD. A total of 33 technical papers were presented.

VISITS TO NATIONAL PROGRAMS

Since 1989, these visits have become more structured. Whereas the Coordinator concentrates on visiting the five lead NARS in order to effectively monitor the collaborative research projects in those countries, Steering Committee members from strong NARS visit the weaker NARS.

The Coordinator will also undertake pre-season visits to some of the weaker NARS during which he would carry seeds for that season's regional trials and discuss difficulties with respect to planting and management of the trials. To further structure and standardize these visits, guidelines and manpower information sheets have been prepared.

The following visits were made in 1989 and 1990:

1. Senegal and Gambia by M.D. Traoré in September, 1989
2. Burkina Faso by the Coordinator in October 1989
3. Guinea (Conakry) and Sierra Leone by the Coordinator in April, 1990.

The following visits are scheduled for 1990:

1. Benin and Togo - S. Da
2. Ghana - C.C. Nwasike
3. Chad and Central African Republic - O.P. Dangi
4. Niger, Nigeria, Burkina Faso and Guinea Bissau - the Coordinator.

V. DIFFICULTIES AND SHORTCOMINGS

Regional Trials

The quality of the results needs to be improved. The coefficient of variation from a number of locations have been too high for the results to be included in the statistical analyses. The notebooks containing the results are received too late and thus the preparation of the annual progress report is also delayed. More and more NARS are requesting funds for the conduct of these trials. It is not known how the absence of funds for these trials have affected the level of management of the trials. Another difficulty has been that the results from these trials have not been widely distributed to the NARS. Almost always the French versions of these results and of the annual progress report do not exist. The reason for this latter problem is given below under secretariat and translation services.

Secretarial and Translation Services

The office of the Coordinator has one bilingual secretary and a driver. For the most part, the secretary is occupied with typing of reports, letters and other documents and of the translation of such documents into French when necessary. However, longer reports such as the annual progress reports remain in English, yet 13 out of the 17 member countries are French speaking. It has proved difficult to find competent personnel who are familiar with technical and scientific words to be hired on an adhoc basis for this purpose.

Visit to NARS

The size of the Network, with 17 countries, creates a problem with respect to annual visits by the Coordinator. Even if half of these countries are visited per year, it takes a lot of time to travel and to effectively interact with officials and the NARS scientists during the limited period when the crop is going through its maturity cycle -heading to physiological maturity. Thus, visits to NARS by the Coordinator have not been as frequent as it should be.

Training

Enough emphasis has not been given to training. During the period under review, only two short-term training programs were conducted.

Collaborative Research Projects

The project on *Striga* in Cameroon was started one year later than the other projects. There were logistic and technical difficulties

with the project on long smut in Niger during the first year. Thus, no preliminary results are available.

Promising varieties

The promising lines from the regional trials since 1986 have not been intensely evaluated. Only recently efforts have been made in this respect. A systematic procedure by the the Network to get NARS to use these lines in their programs should have been developed. For example, separate multiplication and distribution of the seeds to breeding programs of the NARS.

VI. FUTURE THRUST OF THE NETWORK

The following activities are proposed under the grant for Phase III:

- 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 will 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.

VII. AREAS OF FUNDING

Salaries and Allowances

Senior professional staff
Support staff

Operational Expenses

Regional Trials
Package and dispatch
Support to NARS

Seed Multiplication
Labor
Field Supplies

Regional Workshops
Monitoring Tours
Communications
Steering Committee Meetings
Office Supplies
Research Projects
Res. Projects Working Groups
In-service Training
Degree Training
Travel

Vehicle Operation and
Maintenance

Subtotal

Commodities and Equipments

Field/Lab Equipments
Office Equipments
Vehicle Replacement

Subtotal

1. New for the futur

TABLE 1. Sorghum Production in WCASRN Countries for 1988¹.

Country	Area harvested (1000 ha)	Yield (kg/ha)	Production (1000 MT)
Benin	125 F	840	105
Burkina Faso	1295	779	1009
Cameroon**	470	872	410
Centr. Afr. Rep.**	60 F	833	50 F
Chad**	990 *	697	690 *
Cote d'Ivoire	38	632	24
Gambia**	70 F	1057	74 *
Ghana	240 F	729	175
Guinea	6 F	667	4 F
Guine Bissau	60 F	583	35
Mali**	1624 F	1170	1900 *
Mauritania**	133 F	689	89
Niger	1470	410	603
Nigeria	4500	1098	4940 F
Senegal**	1026	618	634
Sierra Leone	8 F	2375	19 F
Togo	178	674	120 *
World	45590	1355	61787
Africa	17556	870	15280

1. Source: The FAO Production Yearbook 1988.

F = FAO estimate

* = Preliminary data

** = Sorghum plus millet data

Table 2. West and Central African Sorghum Research Network's 1990 regional trials and nurseries.

Country	Trials and number of sets				
	WASVAT				WASHAT
	Early	Medium	<i>Striga</i>	Diseases	
Benin	0	1	1	0	1
Burkina Faso	2	2	0	1	2
Cameroon	1	1	1	1	2
Central Afr. Rep.	0	1	0	0	0
Cote d'Ivoire	0	1	0	0	2
Gambia	1	1	0	0	0
Ghana	1	2	1	1	2
Guinea	0	1	0	1	0
Guinea Bissau	0	1	1	1	0
Mali	1	1	1	1	3
Mauritania	1	0	0	0	0
Niger	1	1	1	1	3
Nigeria	2	2	4	0	1
Senega	1	1	0	0	0
Sierra Leone	1	1	0	0	0
Tchad	1	1	0	0	0
Togo	1	0	1	0	0
Total	14	18	11	7	16

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Department of Rural Economy and Agriculture (DREA)

African Union Specialized Technical Office on Research and Development

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