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WEST AND CENTRAL AFRICA SORGHUM RESEARCH NETWORK (WCASRN)

WORKING GROUPS ON RESEARCH PROJECTS

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

B.P. 320, Bamako, Mali

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INTRODUCTION

Basis for Assigning Research Projects to NARS

At the fifth Steering Committee meeting of the West and Central Africa Sorghum Research Network (WCASRN) held in Bamako between 5 and 11 May, 1989, it was decided that the Network should fund research projects in some of the National Agricultural Research Systems (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).

This approach to assigning research projects is perhaps subjective. The Network hopes to follow a more objective procedure in the future in which lead NARS, and perhaps also associate NARS, will compete for research funds by submitting research proposals on any of the constraints identified in Table 1. A revision of Table 1 might also be necessary.

Rationale for Working Groups

The idea of working groups on research projects is not new. The approach used in identifying and assigning research projects as mentioned above and the rationale for the working groups closely follow those of the Regional Cooperative Potato Network (PRECODEPA) in Central America. Technologies developed in the lead NARS, through the respective projects, could be tested further in the associate NARS and then made available for use, where applicable, in other NARS. Thus, after having identified and assigned research projects, it is important that they be properly monitored and evaluated to ensure high standards and regional outlook. A working group becomes a forum for NARS scientists to evaluate a project, to discuss common problems, and to make recommendations for the future.

Scope of the Report

The purpose of this report is to present in general terms, the status of the research projects of WCASRN. Emphasis is placed on the working group meetings. It was thought that by summarizing the activities of the groups, the reader would get a fairly good picture of the progress made after the first year of implementation of the projects without getting into too much technical details. The first section of the report gives an overview of the projects, except that for grain quality which would start in 1991. The following three sections are summaries of the proceedings of the pathology-entomology, grain utilization and *Striga* working groups. They cover the projects on leaf anthracnose and head bugs, on sorghum/wheat composite flour, and on resistant testing for *Striga*, respectively. Finally, there is a section on miscellaneous matters related to the projects such as, funding, duration and method of reporting. Standard forms used for summarizing the original project document, for yearly progress report, for financial reports, and for evaluation of the projects are given in the Annex.

BRIEF DESCRIPTION OF THE PROJECTS

Project Titles, Principal Investigators and Objectives

There is a total of five projects. 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 Neyya, 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, which should start in 1991, will be 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.

PATHOLOGY-ENTOMOLOGY WORKING GROUP

Composition

The members of the Pathology-Entomology Working Group are as follows:

- A. Neya - Pathologist and principal investigator, anthracnose project
- Y. Doumbia - Entomologist and principal investigator, head bug project
- I. Kollo - Pathologist and Principal investigator, long smut project
- M. Diourté - Pathologist, Mali national program
- S. Maïga - Entomologist, Niger national program
- A. Ratnadass - Entomologist, ICRISAT-IRAT/CIRAD, Bamako
- The Chairman of WCASRN Steering Committee
- The Coordinator of WCASRN.

First Working Group Meeting

The first meeting of the Pathology-Entomology Working Group was held at ICRISAT's Regional program in Bamako on 19 and 20 April, 1990. In addition to the members listed above, the following were present as observers:

- J. Andrew Frowd - Pathologist and Principal Technical Adviser, UNDP/FAO, Bamako
- Fatoumata Bocoum - Research Assistant, pathology sub-program, ICRISAT Regional program, Bamako
- Ibrahim Sissoko - Research Assistant, pathology sub-program, ICRISAT Regional Program, Bamako.

Results of the first year's work on the projects were presented and future work plans were discussed at the meeting. Some members of the Working Group were appointed evaluators and were required to fill out standard evaluation forms. Presentation of results and discussions were completed on the first day. A representative from ICRISAT accounts section was invited to one of the sessions. She explained, especially for the benefit of the principal investigators, procedures for preparing and presenting financial reports. The meeting ended in the morning of the following day, April 20, after general discussions, presentation of summaries of sessions by rapporteurs, and closing remarks by the chairman of the Steering Committee and the Coordinator.

With respect to progress made after the first year, the project on leaf anthracnose used the composite spreader row technique to screen 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 the anthracnose fungus *C. graminicola* was higher in introduced genotypes. In addition to confirming these first year's results, work on the variability of the pathogen will be undertaken during the second year.

Results from the head bug project 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 25 out of 100 lines were resistant to *E. marginatus*. Further lines were identified in an advance trial and in an international trial. 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 areas. 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. Attempts were made to develop a suitable inoculation technique to screen for the disease by artificial inoculation. Only one or two sori developed on three plants 20 days after inoculating several plants using three forms of

inoculation techniques. The principal investigator hoped to continue field work on screening from natural inoculum, on laboratory aspects of culturing the fungus, and on determination of the viability of stored propogules of the fungus.

The main points from the reports of the two evaluators of the project on leaf anthracnose based on the results of the first year's work are as follows:

- the objectives were achieved
- the method of scoring for disease severity is time consuming, especially when up to 80 lines are being screened. The investigator scores the top four leaves of 10 tagged plants per variety in each of two replications;
- the height of plants should be taken into account during scoring;
- the number of entries should be reduced, and more emphasis should be placed on the level of infection of the spreader rows with respect to rate of infection;
- there should be studies on cross inoculations of the different isolates of the fungus.

The overall rating of the project by both evaluators was 2 (= good) on a 1-3 scale.

The evaluator of the project on head bugs thought that the objectives were partially obtained. In his report, he indicated that more studies on economic threshold, and yield losses should have been carried out. He suggested that for the future more emphasis should be placed on the level of infestation in farmers' fields, on the population of natural enemies of the head bug insect, and on the mechanism of resistance. He gave an overall rating of 2 for the project.

The project on long smut was not evaluated since no formal report was presented by the principal investigator.

GRAIN UTILIZATION WORKING GROUP

Composition

The following are members of the Grain Utilization Working Group:

- L.B. Olubegmi - Food technologist and principal investigator
- R.E. Aluko - Biochemist and principal investigator
- C.C. Nwasike - Cereals breeder, Institute for Agricultural Research, Ahamadu Bello University
- Mariam Fofana Haidara - Food technologist, IER, National program of Mali
- The Chairman of WCASRN Steering Committee
- The Coordinator of WCASRN.

First Working Group Meeting

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, O. Ajayi attended the meeting. The same procedure was followed as in the Pathology-Entomology Working Group.

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.

Based on the first year's results, the evaluator of the project thought that two of the four objectives were achieved. It was mentioned that the project had completely achieved the objectives related to the laboratory aspect of the work. In the evaluator's report it was mentioned that sorghum substitution of between 30 and 50% would seem too high for bread outside of laboratory conditions and that the investigations should consider reducing their level of sorghum substitution to about 20% for practical production outside the laboratory. The evaluator agreed that 60% substitution for confectioneries could be retained. Furthermore, with respect to the people involved in filling out questionnaire on acceptability, their sample should be increased and should be more diverse and representative of the social and other groups in the town. The project was rated 2 overall.

STRIGA WORKING GROUP

Composition

The members of the *Striga* Working Group are :

- Richard Kenga, Sorghum breeder and principal investigator
- S.T.O. Lagoke, Agronomist, Institute for Agricultural Research, Ahmadu Bello University
- C.C. Nwasike, Cereals breeder, IAR
- N. Titus, Agronomist, IRA, Cameroon national program
- B. Dembele, *Striga* specialist, IER, Mali National program
- G. Hoffmann, *Striga* specialist, ICRISAT-IRAT/CIRAD, Bamako
- The Chairman of WCASRN Steering Committee
- The Coordinator of WCASRN.

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. Except for B. Dembélé and G. Hoffmann, all the members of the Group mentioned above were present. Y. Doumbia attended as an observer. 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.

After examining the circumstances and the current situation, the committee agreed that:

- 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.

MISCELLANEOUS

Funding of the Projects

Since Phase II of SAFGRAD is ending in 1991, each project is funded for three years in the first instance. Four of the six projects, leaf anthracnose, head bug, long smut, and wheat-sorghum composite flour, started in 1989, while the project on *Striga* started in 1990. The project on grain quality should start in 1991. The Steering Committee decided that for 1989 and 1990 each project will receive \$5,000 per year. Funding for 1991 was decided in December, 1990 at the eighth Steering Committee meeting as follows:

Head bug	-	\$ 8,000
Leaf anthracnose	-	\$ 8,000
<i>Striga</i>	-	\$ 8,000
Long smut	-	\$ 6,000
Grain quality	-	\$ 5,000
Wheat/sorghum composite flour	-	\$ 9,000.

Funds for these projects come from the line item Network Support of the budget, and payments are made in two equal installments per year.

Financial Accountability

Principal investigators decide on detailed expenses, using the line items they presented in their project proposals as a guide. They are required to submit a financial report, with supporting documents. The financial report is the basis for receiving the second half of the total sum for a project for a given year. Thus, two financial reports are required each year. Unfortunately, some projects have not submitted any financial report. In this regard, a standard form was prepared on which Directors of NARS where each project is conducted will sign ascertaining expenditures incurred. The English version of this is given in the Annexe of this report.

Method of Technical Reporting and Evaluation

Each principal investigator is required to fill out a Project Format (PF) form. This form provides for a brief description of the objectives, methodology, and expected impact of the project. The PF format is required in addition to the original detailed project document. At the end of each year, the principal investigators fill out a single page Annual Report (AR) form. Detailed annual reports are also required. The PF and AR forms are useful to the Coordinator, the Steering Committee, and other interested parties who need a quick overview of progress made. Examples of the English versions of these forms are given in the Annex.

Each project is evaluated at the working group meetings. Evaluators are appointed by the Coordinator and they fill out a standard evaluation form, an example of which is also given in the Annex.

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 Adapting Centers.

Country	Insects		Diseases					Grain				
	PAN	BOR	GM	SS	AN	GL	LS	<i>Striga</i>	QL	UT	DR	ST
Burkina Faso	A	A	L	A	L	A		A	A			
Cameroon				A	A	A		L			A	A
Mali	L		A	A	A	A	A	A	A		L	A
Niger		A					L		L		A	
Nigeria	A	L	A				A	A		L	A	L
Côte d'Ivoire	A				A	A						
Ghana	A		A									
Bénin												
CAR												
Chad												
Gambia											A	
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.

A N N E X

WEST AND CENTRAL AFRICAN SORGHUM RESEARCH NETWORK
(W C A S R N)

USAID/OAU-STRC/SAFGRAD/ICRISAT
Collaborative Research Projects

JUSTIFICATION OF EXPENSES

1. Project title : _____

2. Principal Investigator : _____
3. Country : _____
4. Date covered by statement : From _____ to _____
5. Receipts attached _____ Yes _____ No
6. Details of expenses (fill in where necessary)

<u>Items</u>	<u>Cost (indicate currency)</u>
1. Equipments	_____
2. Supplies	_____
3. Salaries (Technician)	_____
4. Salaries (Labor)	_____
5. Travel (Hotel, per diem)	_____
6. Petrol	_____
7. Repairs to vehicle	_____
8. Repairs to mobylette	_____
9.	_____
10.	_____
11. Other (specify)	_____

Total expense _____
Amount received _____
Balance _____

7. Signature of Principal Investigator _____
8. Name of Director of Research or
Chief of Research Station _____
9. Signature of Director of Research or
Chief of Research Station _____
10. Date _____
11. Appropriate stamp

WCASRN COLLABORATIVE PROJECT FORMAT

Starting date : _____

Title :

Principal Investigator :

Training Component :

Objectives :

Techniques :

Expected impact of the project :

Coordinator WCASRN

Chairman Steering
Committee WCASRN

Principal
Investigators

Date _____

WCASRN ANNUAL REPORT

Period : From _____ to _____

Title

Continuing : _____

End : _____

Investigators :

Brief report :

Training : Number of persons : _____ % of project resources : _____

Future workplan for next year :

Recommendations of Steering Committee :

Publication :

Coordinator WCASRN

Chairman Steering
Committee WCASRN

Principal
Investigators

Date : _____

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1991-04

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