



Intsormil

TRIP REPORT

BY

L.W. ROONEY AND D.T. ROSENOW
TEXAS A&M UNIVERSITY

NIGER, UPPER VOLTA AND MALI
OCTOBER 6-25, 1983

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☆ International
Sorghum/Millet

☆ Collaborative Research
Support Program
(CRSP)

A Research Development Program of the Agency for International Development, Participating Land-Grant Universities, Host County Research Agencies and Private Donors.



Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln



TAC TO NIGER, UPPER VOLTA AND MALI
CONDENSED ITINERARY AND DAILY ACTIVITIES
L.W. Rooney and D.T. Rosenow (October 6-25, 1983)

- October 6, 1983
Thursday 9:20 a.m. Rooney departed College Station, Texas. Met Dr. D.T. Rosenow in the DFW Airport. Arrived Niamey, Niger, via Paris and New York. Dr. John Axtell and J. Munday joined the team in Paris. Met by Dr. J.W. Clark, Acting Team Leader, Niger Cereals Research Project, at 7:00 p.m.. We met Mr. Moussa Adamou, INRAN Sorghum Breeder, and Mr. Ouendeba Botorou, Millet Breeder. Overnight - Niamey.
- October 7, 1983
Friday The team traveled to the N'Dounga sandyland substation and several farmers' fields of P. millet and sorghum and then to the Kolo Experiment Station (30 km southeast of Niamey). Bundles of P. millet heads were examined at the Kolo Station. Evaluated Dr. John Clark's sorghum breeding material at Kolo Station. Mr. Rudy Vival, USAID, accompanied us as well as Mr. Adamou. Overnight - Niamey.
- October 8, 1983
Saturday The team reviewed seed increases and nurseries at Lossa, 75 km northwest of Niamey and at Tillaberi. Several farmers' fields were observed along with irrigated sorghum fields along the Niger River near Tillaberi. Overnight - Niamey.
- October 9, 1983
Sunday Team met Mr. Moussa Saley, Director General, INRAN, and discussed present and future INTSORMIL and Purdue research. Toured the Quality Laboratory Program, directed by Mr. Moussa Oumarou. Visited wholesale and retail grain markets and discussed the current grain quality work. Overnight - Niamey.
- October 10, 1983
Monday Drs. Rosenow, Rooney and Clark returned to Kolo to make additional selections and decisions on items to save in the sorghum nursery and to examine the collection of local sorghums. Returned to Niamey and met with Mr. Rosenthal, Director, USAID. Departed Niamey. Team of Rooney, Axtell, Rosenow, Adaneou, Clark and Munday arrived in Ouagadougou, Upper Volta at 4:00 p.m.. We were met by members of the Purdue Farming Systems Project. Overnight - Ouagadougou, Upper Volta.
- October 11, 1983
Tuesday Dr. Ron Cantrell, Team Leader, Purdue Farming Systems Project, showed the team typical farming systems in trials in the village of Nadogo, which is 20-25 km northwest of Ouagadougou. Several farmers' fields were observed also. Both sorghum and millets responded to furrow diking and fertilizer. Overnight - Ouagadougou.
- October 12, 1983
Wednesday Dr. Pattanayak, ICRISAT Sorghum Breeder and Team Leader, showed the team his extensive sorghum nurseries at Kamboinse and reviewed the ICRISAT program in Upper Volta. Dr. Lohani gave the team a brief tour of his
- October 13, 1983
Thursday

ICRISAT millet program at Kamboinse. Met with Mr. Dale Rachmeler, USAID, and reviewed INTSORMIL activities. Set up an appointment with Voltaic Agriculture Research Service. Overnight - Ouagadougou.

October 14, 1983
Friday

Dr. Ramaiah, ICRISAT, Striga Project Leader, reviewed his Striga research program and we toured the nursery at Kamboinse. We traveled to Yako, approximately 120 km north of Ouagadougou, to evaluate village farming systems trials using Striga tolerant lines being conducted by ICRISAT personnel. Met Drs. Wilhelm Stoop, Peter Matlock and Helga Vierich at the village of Kolbila. Team returned to Ouagadougou and accompanied by Mr. Rachmeler, USAID, met with Dr. N. Bosso, Advisor, IVRAZ, to determine the possibilities of INTSORMIL assisting Dr. Sansan Da in his sorghum breeding program. Overnight - Ouagadougou.

October 15, 1983
Saturday

Dr. Pattanayak, ICRISAT, and the team (Dr. Axtell returned to USA) traveled by auto to Bobo Dioulasso, Upper Volta, where we were met by Dr. Sansan Da (Voltaic Sorghum Breeder (Ph.D. plant breeding, Texas A&M University, December, 1982) and Drs. J. Peacock and Sam Mukuru, ICRISAT, Hyderabad, India. Reviewed part of the sorghum programs at the Farako Bâ, IRAT Experimental Station. On the way to Bobo Dioulasso, Rosenow, Rooney, Clark and Adamou stopped at SARIA and reviewed the IRAT sorghum breeding nursery through the courtesy of Dr. Jacques Chantreau, IRAT Sorghum Breeder. Overnight - Bobo Dioulasso, Upper Volta.

October 16, 1983
Sunday

Drs. Pattanayak and Sansan Da conducted a tour of the sorghum nurseries at the Farako Bâ station in the a.m.. That afternoon, the group was invited to a fonio cous-cous lunch prepared by Kadane Da. In the evening, we had dinner with Dr. and Mrs. Da. Overnight - Bobo Dioulasso, Upper Volta.

October 17, 1983
Monday

In early a.m., met with Dr. Sansan Da and reviewed a draft of a project that he wants to submit to INTSORMIL for possible support. Returned to Ouagadougou. Overnight - Ouagadougou.

October 18, 1983
Tuesday

Drs. Rosenow and Rooney and Mr. Rachmeler, USAID, discussed a potential collaborative research program (INTSORMIL-IVRAZ-Dr. Da) with Dr. N. Bosso, advisor to IVRAZ. Departed Ouagadougou at 3:05 p.m. on RK300 to Niamey. Departed Niamey at 10:10 p.m. (Air Algerie 5230) with arrival in Bamako, Mali at 11:00 p.m.. We were met by Dr. Oumar Niangado. Overnight - Bamako.

October 19, 1983
Wednesday

In a.m. were briefed by Dr. O. Niangado, contacted Dr. S.K. Reddy, USAID. Conferred with Dr. J. Scheuring, Sorghum Breeder, ICRISAT, Mali, and evaluated sorghum nurseries on the Sotuba Experiment Station. Overnight - Bamako.

October 20, 1983
Thursday

In a.m., met with Mr. Dolo, Director of SRVCO (Food Crops Research) (Sotuba Substation) and Dr. Niangado. Evaluated sorghum and millet lines in nurseries at the Sotuba Station in the morning. We were briefed by Ms. Assa Kante, Food Scientist, ICRISAT, on the current status of sorghum and millet food quality research. Mr. Lamine Traore (M.S.-Texas A&M University-1983) briefed us on his ASAFGRAD agronomic and farm trials program in Mali. In p.m., met with Dr. S.K. Reddy, USAID, to discuss the status of the TROPISOILS-INTSORMIL CRSP agreements. Overnight - Bamako.

October 21, 1983
Friday

Drs. Rosenow, Rooney and S.K. Reddy met with Malian officials and discussed the TROPISOILS-INTSORMIL agreement. Malian officials were:

Mr. Adama Coulibaly
Acting Director General (Fatagoma Traore was out of the country.)
IER (Institut d'Economie Rural)

Mr. Zana Sonogo
Director, Division of Agronomic Research
IER
SRVCO (Section de Recherche: sur les Cultures Vivrieres et Oleagineuses)

Mr. Dolo
Director, Food Crops Research
SRVCO

We were able to agree on all items except two. The Malians insisted that the following items should be in the General Agreement: a) one vehicle be purchased and b) that there should be a statement indicating that "PERKS" would be paid to Malians working on the INTSORMIL-TROPISOILS project. These points were not resolved and Dr. Arthur Onken and Dr. Vollmar were called by phone concerning these points. Overnight - Bamako.

October 22, 1983
Saturday

Dr. J. Scheuring took us to the Experiment Station at Cinzana where both the sorghum and P. millet nurseries were critically examined. Returned to Bamako in the late afternoon. Overnight - Bamako.

October 23, 1983
Sunday

During the a.m., we met Drs. Hall and Wilcock who were reviewing the USAID sponsored ICRISAT - Mali program. We spent from 8-12:30 discussing various aspects of the ICRISAT Mali project and the relation of INTSORMIL with Mali and other countries in West Africa. In the p.m., we met with Drs. Scheuring, Serafini and O. Niangado. In the evening, we were entertained by Mr. Lamine Traore, SAFGRAD Project Coordinator, who completed his M.S. at Texas A&M with Dr. F.R. Miller in 1982.

David C. Wilcock
 Extension Economist
 Dept. of Food and Resource Economics
 202 Draper Hall
 University of Massachusetts
 Amherst, Massachusetts 01003
 Ph. 413-545-1921

Anthony E. Hall
 Prof. of Plant Physiology and Agronomy
 Dept. of Botany and Plant Science
 University of California
 Riverside, California 92521
 Ph. 714-787-4405

Overnight - Bamako

October 24, 1983
 Monday

Met Dr. Doumbia Yacouba, Entomologist, who is in charge of the IPM program (partially sponsored by F.A.O.) and Assistant Food Crops Research Director under Mr. Dolo. We reviewed our activities and discussed the importance of head bugs, molds and grain type on sorghum food quality. We returned to the sorghum and P. millet nurseries at the Sotuba Station to complete evaluations and obtain appropriate samples. We briefed Dr. Reddy, USAID, on our accomplishments and discussed the need to proceed quickly to get the agreement signed. We departed Bamako Airport at 11:00 p.m.. Overnight* - Bamako.
 *We had to pay for the room for the night of October 24 since we did not depart for the airport until 9:30 p.m..

October 25, 1983
 Tuesday

Bamako - Paris - New York - Dallas - College Station (Lubbock). Arrival College Station at 11:00 p.m..
 Rosenow arrived Lubbock at 11:00 p.m..

NARRATIVE

WEST AFRICAN TRIP REPORT (NIGER, UPPER VOLTA, MALI)

The comments that follow are a condensed summary of the major findings of this technical assistance mission. Details of the post harvest technology of sorghum and millets in West Africa have been summarized by Rooney and Kirleis (1979). In this report, I have tried to point out essential differences. Drs. Rosenow and Axtell will cover their subject matter areas.

Niger

Sorghum and P. millet grain quality in Niger appears to be similar to the problems of Upper Volta and Mali. The sorghum types that are consumed range from large-seeded durras to relatively small-seeded Margarita-Ferrums based on our observations (limited). The sorghums of Niger are more variable than those of Upper Volta and Mali (except Northern Mali).

The sorghums are grown under irrigation, under the Gao tree (Acacia albida) and in the wetter, lower parts of the fields and around small ponds. Special varieties are grown in different areas of the fields.

P. millet is the major cereal in the areas of Niger we traveled. The P. millet spikes are long with large amounts of grain that varies in color from yellow to slate grey. Apparently, yellow endosperm and yellow pericarp colors exist. A large amount of "yellow" P. Millets existed in Niger (also Upper Volta). Two distinctly different types of P. millet are grown based upon maturity classes. The Haini-Kere (HK) P. millets (usually yellow) mature early, they fall in the souna class. In contrast, the Maiwa are late maturing (Sanio, Sanyo).

Sorghum and millet are consumed mainly as a thick porridge (Tô, Touwo) which is consumed with a sauce that is composed of many ingredients. Acid conditions are mostly used in preparation of Tô (Touwo). The sorghum or millet is hand pounded to remove the pericarp and ground by additional hand pounding into flour for Tô. Cous cous and other products are consumed but are apparently of less importance.

The sorghums in the nursery were badly damaged by a combination of head molds, head bugs and weathering. The tight-headed sorghums were especially susceptible to this complex. The result was badly stained, discolored, molded, soft kernels that definitely had poor food quality. The grain is difficult to mill and produces poor quality Tô.

Sorghum and Millet Quality Research

The laboratory in Niamey, using existing facilities, equipment and limited personnel, has initiated work on sorghum and millet quality. Mr. M. Oumarou presented data on sorghum lines that he has evaluated. It will need to be strengthened considerably to provide useful information to the breeding programs. Several recommendations to increase the laboratories potential are as follows:

1. Provide a short-term consultant (Cereal Technologist-Breeder) for up to 2-3 months to evaluate the laboratory, make recommendations on equipment, procedures and assist the laboratory director in developing an outline for a five-year program on quality research. The consultant should have an understanding of plant breeding programs as well as cereal technology. Dr. Sansan Da, IVRAZ, Bobo Dioulasso, Upper Volta, has the ideal background for this mission. Dr. J.O. Akingbala; Crop Processing and Utilization Division; National Cereal Research Institute; Moor Plantation; Ibadan, Nigeria, is another possibility although he cannot

- speaking French. Both scientists were trained at Texas A&M University and are aware of grain quality research program procedures.
2. Information on the major uses of sorghum, P. millet and cowpeas in Niger should be obtained. The differences in milling and T₀ preparation in Niger should be determined for the major regions. The 1979 report of Rooney and Kirleis could serve as a background. A thorough survey of the Nigerian literature should be made. Reports from the SOTROMIL project in Zinder should be obtained and reviewed. If equipment from that project is available, it should be evaluated and made available to the laboratory.
 3. A Peace Corps volunteer with an interest in food quality may be extremely useful to assist in the development of the laboratory. The close cooperation of the consultant (Suggestion #1) with the Peace Corps volunteer could be an effective way of developing the grain quality program. The Peace Corps volunteer might benefit by a short training program at INTSORMIL institutions in the U.S.
 4. A Nigerian (probably Mr. Moussa Oumarou) should visit laboratories in appropriate INTSORMIL institutions and elsewhere. The trip would provide opportunities to review procedures and equipment. This should be done after items 1-3 are accomplished in late 1984.
 5. There is a need to develop a collection of reference material on grain quality procedures and information. Copies of the grain quality proceedings, "Sorghum in the 80's", etc., should be obtained. The slide sets of sorghum quality and kernel properties were made available to Dr. J. Clark and another set will be sent.
 6. The training of Nigerian students in Food Science and Technology with emphasis on grain is absolutely necessary. Ideally, at least one M.Sc. and one Ph.D. will be required.
 7. The most common P. millet and sorghum varieties should be grown under comparable conditions to provide samples for analyses. These samples could be submitted to appropriate INTSORMIL laboratories for detailed analyses to assist the Niger laboratory to acquire baseline information. Thus, ideally, these samples might be available for Mr. M. Oumarou to work on during his visits to INTSORMIL laboratories. Samples of millet and sorghum with "good and poor" food quality should be included in the samples.
 8. Amino Acid Analysis: The laboratory has an old Beckman Automated Amino Acid Analyzer that is in need of repair. The need for amino acid analysis is not very large and the existing analyzer should not be repaired or replaced. Amino acid analyses on limited numbers of samples to ascertain the variation in composition of Nigerian commodities could be obtained from Purdue University. The most effective use of scarce funds would be to acquire equipment and procedures for general use. The repair is too expensive and will not be effective unless a technician is specifically dedicated to its use. If needed, amino acid analyses should be done with HPLC or more versatile instruments.
 9. An INTSORMIL scientist should review the grain quality program periodically.

The need for a permanent staff member (expatriot) in the grain quality area can probably be met by providing Dr. J. Clark, Sorghum Breeder, to work closely with the quality aspects of sorghum and P. millet provided a

satisfactory short-term consultancy can be obtained. A permanent staff member in the area of agronomy would be more useful.

Upper Volta

Drs. Pattanayak, Lohani, Ramaiah, ICRISAT, and Cantrell, Purdue Farming Systems Project, provided the team with an excellent program. The sorghum nurseries in Ouagadougou were damaged extensively by the head bug/mold combination. Dr. Pattanayak has made crosses in an attempt to obtain a sorghum with a more open head type which may have better tolerance to head bugs/molds. Most early maturing sorghums were damaged severely. It was good to see the diversity of head and grain types incorporated into the program.

The P. millets of Upper Volta were notably less productive than those of Niger. P. millets with yellow endosperm were found in farmers' fields. The P. millet nursery at Ouagadougou was difficult to evaluate. Many problems prevent exotic germplasm from being useful in Upper Volta.

Dr. Ramaiah's Striga nurseries and village trials seemed to indicate that Fromedia, a brown-seeded sorghum, has some resistance to Striga. These trials also demonstrated the extreme difficulty of evaluating resistance to Striga. Arrangements were made to obtain samples of Striga "resistant" and susceptible sorghum lines for phenol analyses in our laboratory.

The Upper Volta National (IVRAZ) Research Program is currently a part of IRAT. We evaluated nurseries in SARIA and Farako Bâ. Dr. Sansan Da, currently an IRAT sorghum breeder, has initiated a sorghum research program at Farako Bâ. Dr. Da, an Upper Voltaic, graduated with a Ph.D. in sorghum breeding (food quality) from Texas A&M University in 1982. He has planted nurseries and made collections of Voltaic sorghums. Dr. Da has written a research project to seek funds from INTSORMIL for collaborative research. The proposal is attached to this report. Dr. Da's program, although only beginning, was an impressive start. The chances for meaningful collaboration between INTSORMIL and IVRAZ was investigated with the help of Mr. Rachmeler, USAID. We had a good response from Dr. w. Bosso, advisor to IVRAZ. Sample agreements used by the peanut CRSP to fund a project in Upper Volta were obtained.

Mr. Rachmeler, USAID, was very pleased with the prospect of INTSORMIL providing a small grant to Dr. Sansan Da. The prospect of being able to fund a small project to support the program of a recent graduate of an INTSORMIL institution is one that should be given high priority. Dr. Da could provide the opportunity for our first such endeavor. IVRAZ is currently attempting to integrate all agricultural research including IRAT into their organization. The team recommends that a small (\$10,000/yr) project be initiated with IVRAZ to support Dr. Sansan Da's Voltaic sorghum breeding and improvement program. IVRAZ will not be ready to proceed until March of 1984 depending upon their reorganization. Mr. Rachmeler indicated that he would assist in development of the project.

Mali

The head bug/mold complex was a serious problem in the nurseries in Mali. In general, sorghums with a tight head had severe problems although some variation existed. Dr. Scheuring's program in Mali has tremendous diversity in head types and kernel characteristics where a high priority is given to produce grain with acceptable food quality. He is looking for a semi loose-headed type that has "waxy" glumes with a hard kernel that is maintained over various environments especially when grown under drought. Some sorghum lines produce grain that may give good T₀ when consumed fresh; but, they produce poor quality T₀ after storage. The local Malian

varieties produce good T δ after storage. More information is needed on kernel structure, etc.

Samples of sorghum from various types were taken for analyses. Additional studies of samples to be selected by Scheuring will be obtained. The "waxy", hard glumes of some sorghums will be compared to those with soft, papery glumes.

Ms. Assa Kante, who does the cereal food quality research, reviewed her data on food quality trials of P. millet. Samples of these grains were obtained for collaborative research. Ms. Kante is studying English to enable her to enroll in graduate school. We will make room for her in our program provided she can master English.

Dr. Niangodo reviewed the P. millet and sorghum nurseries with us. P. millet samples with a "bronze" (looks like a brown P. millet), yellow, purple and slate grey appearance were obtained. The "bronze" millet apparently comes from Mauritania and is not desired in Mali. The Malian P. millets were more diverse than we saw in Upper Volta. A few yellow endosperm P. millets are grown in Mali. Plans were made to do basic studies on the structure of the kernels of P. millet samples that had shown clear differences in village milling and cooking quality trials conducted in Mali.

We wish to thank all of the personnel that contributed to this successful West African consultation, especially the ICRISAT personnel in Upper Volta and Mali and the Purdue-Niger Cereals Program, who provided logistical support. A special thanks to Mr. Rachmeler, USAID in Upper Volta, for arranging the meetings with IVRAZ.