



Intsormil

TRIP REPORT

SUDAN

by

J. D. EASTIN

UNIVERSITY OF NEBRASKA

APRIL 22-MAY 1, 1983

CONTRACT NO. : AID/DSAN/XII-G-0149

☆ 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



SUDAN TRIP REPORT

April 21-30, 1983

Departure from the US was late 21 April with arrival in Khartoum shortly before midnight April 22. Dr. Gerald Owens, Western Africa Agricultural Project Chief of Party, was kind enough to meet the plane and managed to get equipment through customs. Equipment carried was a leaf area meter, infrared thermometer, pressure vessel for leaf water potential measurement, and an integrating sensor. The three wheel small truck which arrived about 4 weeks ago was still in customs due mostly to some illnesses of WSARP staff. As a consequence the truck kit was not assembled for use. It probably will be retrieved from customs within a week for Dr. Saeed Farah at Wad Medani.

A call was made to WSARP headquarters Saturday morning to see Dr. James Riley, ARS Senior Advisor. However, he was ill and unavailable. Dr. Owens and I visited with Ms. Joyce Turk of the US AID office regarding transportation, particularly to Wad Medani on Tuesday. We returned to WSARP but Dr. Riley was still ill.

A Monday morning visit was made to the Faculty of Agriculture in Shambat. The first call was made to Dr. Karouri regarding arrangements for Mr. Mohammed Abdelrahman's pending summer research in Shambat as part of his Nebraska Ph.D. program. Arrangements with both AFGRAD and the Agronomy Department Faculty were proceeding nicely. However, inadequate netting is available for bird protection at Shambat. The suggested AFGRAD budget appears adequate to handle things if there is adequate time to get the netting supports erected. Mr. Abdelrahman's trial likely will represent a good first effort to get cooperation going with the Faculty of Agriculture. A second meeting was arranged with Dr. Karouri on Saturday, April 30, but he did not appear. The discussion was to further explore the possibility of AFGRAD students doing part of their research in agronomy and physiology at Shambat and part in the US at INTSORMIL institutions. Telephone contact did not work out. He is very much interested in pursuing cooperative physiology-agronomy research.

The portion of Mr. M. Abdelrahman's dissertation testing planned at El Obeid for the summer of 1983 likely will not materialize due to land limitations according to Dr. Owens. Prospects for cooperative research between WSARP, Shambat and INTSORMIL appear much better in 1984 at El Obeid. A good nucleus of scientific staff is being assembled there.

A courtesy call was made to Dean A. H. El Nadi which turned out to be an extended discussion of the conversations in agronomy. They are inclined to develop a closer productive relationship with WSARP and INTSORMIL in the areas of intercropping and rotations with soil fertility emphasis plus both agronomic and physiological aspects of plant stress. Again, a division of Ph.D level research between Sudan and the US appears desirable since there are some excellent scientists available in Sudan to help supervise student research there.

A visit to the Food Science Center followed but Dr. Sit Badi was in Khartoum. Mail was delivered to her regarding the fall workshops with a note regarding Dr. Frederiksen's visit about May 20 regarding the workshop.

A follow up visit was made to US AID to check on transportation to Wad Medani and scholarship fund possibilities with Ms. Awatif Farag, a training officer. All scholarship funds are channeled through AFGRAD. Short term training can be obtained directly through AID. Ms. Turk was able to arrange transportation to Wad Medani which was greatly appreciated especially with fuel so short.

Mueller's contract papers were delivered to Dr. M. Bakheit on Tuesday with equipment to Dr. Saeed Farah. The equipment included a leaf wetness meter, an infrared thermometer to measure canopy temperature, a leaf porometer, a pressure vessel for measuring plant water status and a solar energy sensor. The remainder of the day was spent planning three experiments. Some time was spent with Dr. Gebisa Ejeta.

Experiment planning was continued with Dr. Farah on Wednesday, April 25. Two water management studies were set up at Wad Medani and Gadambalia. Irrigation water will be withheld at Wad Medani so as to create water stress during panicle development, particularly for the approximate two weeks between differentiation of pistil and stamen primordia and bloom. This will test the stability of different genotypes under stress in terms of the seed number component of yield. Seed number per unit land area usually correlates very positively with yield in North America and will likely also be true in the irrigated Gezira area near Wad Medani. The seed size component of yield may be relatively more important in the harsher rainfed environment of Gadambalia. Irrigation is not available there as a water management tool to induce stress at the desired growth stage. Therefore, a combination of 3 populations in narrow and wide row spacings was set up which likely will result in a range of field stress conditions. Comparison amongst 3 genotypes for yield, percent reduction in seed number and compensation capacity in terms of seed weight increases should give plant breeders better ideas concerning which plant characteristics should be screened for to improve and/or stabilize yields in harsher environments. Physiological measurements should contribute to explaining mechanisms relating to stress susceptibility and tolerance in the Gezira and Gadambalia areas. A preliminary N-response test at Gadambalia was discussed to gain information on potential sorghum response following a legume. Farmer fields are being used at Gadambalia where N has never been applied.

Experiments were then discussed with the plant breeders (Drs. Ejeta, Abdel Latif and Ahmadi), modified some and written up. A summary of objectives is to (1) test the respective contributions of seed size and seed number to grain yield, (2) relate yield components to yield stability or instability of several genotypes under limited water, (3) test a potential breeder screening technique for yield stability characteristics, (4) attempt to relate some physiological parameters to seed size and seed number changes with stress and (5) try to use the information to improve cultural practices (water management at Gadambalia and investigating legume cereal rotations

and/or intercropping) and develop additional breeder screening techniques.

Dr. Bakheit called a meeting Thursday morning of sorghum and millet workers to discuss the contract papers sent by Mr. Carl Mueller. Some concern was registered concerning the conditional release of INTSORMIL equipment to individual investigators following project completion, particularly if ARC is required to pay duty on the equipment as it enters Sudan. The conclusion was that an effort would be made to have duty waived. More serious concerns were (1) being responsible for liabilities which might be accrued during the use of any INTSORMIL equipment and (2) the provision that any disagreements between ARC and Nebraska be settled in accordance with Nebraska laws. The problem arose because the ARC legal advisors do not know what "Nebraska law" means. The general nature of federal versus state laws in the US was explained plus the fact that the University of Nebraska, as a contracting agent, is bound by state law, hence the proposed contract language. The suggestion was made that since state laws governing most land grant universities are similar (but can be different) it might be profitable to examine liability clauses, etc., in the Washington State University - Western Sudan Agricultural Research Project contract to try and get an idea of ways to clarify or improve the contract language. Dr. Bakheit was in Khartoum on Saturday doing that and considering who to approach regarding duty free equipment entry. It was further suggested that he try to prepare a brief amendment, if necessary, to the proposed contract, sign the amendment and send the properly executed documents to INTSORMIL administrators for their consideration. Hopefully this might get formalities taken care of and money to Sudan quickly since the planting season is near.

The remainder of Thursday was spent covering experimental details with Dr. Farah and setting up equipment. Dr. R. P. Jain provided transportation back to Khartoum in an ICRISAT vehicle Thursday afternoon since Friday is the Sudanese Holy Day and an appointment had been set up with Dr. Karouri on Saturday morning at 8:00.

A trip was made Friday to WSARP headquarters to see Dr. Riley under the mistaken notion that the Americans operate on Friday.

Due to unknown difficulties, Dr. Karouri did not make the appointed Saturday morning meeting. A visit at WSARP with Drs. Owens and Riley developed and clarified further probable mutual research interests between the Shambat and El Obeid stations as noted in the appendix. Basically the topics included are tillage options, stand geometry (related to water management) and fertility - rotation - intercropping - legume research. Dr. Riley plans to discuss thoughts from that meeting with Dr. Karouri.

Departure for Cairo was 2:30 AM on May 1.

Appendix

Potential Sudan (El Obeid and Khartoum) cooperative research involving the University of Khartoum, WSARP, AFGRAD and INTSORMIL

Agronomy

Tillage

1. diking
2. mulching
3. limited herbicide use (wick stick w/roundup)

Stand geometry

1. drill in 75 cm rows
2. drill in 150 cm rows
3. hill in 15C cm rows - wide row hilling may ration water better over the season.

Fertility

1. N test to define response levels - this should help in evaluating potential of legume input in intercropping or rotations.
2. Sorghum - cowpeas, groundnuts, beans, other legumes
Millet - cowpeas, groundnuts, beans, other legumes
Rotations might tend to negate striga problems.
3. Use legumes in shifting agriculture schemes?
4. Cereal-legume-N fertilizer trials. Try wide rows and hills with N added about a meter away from hills to see if N pickup by the cereal at the meter extremity has any negative effect on legume N fixation in the hill where legume roots are concentrated. The reverse scheme might also be tried.
5. Start cereal screening in legume-cereal rotation fields

Possible INTSORMIL US dissertation research for AFGRAD students.

1. Evaluate N fertilizer effect on N fixation - perhaps use a split root technique.
2. Study water stress effects on photosynthesis, respiration and related N fixation (N fixation is energy dependent on PHS).
3. Start genotype screening on legume fields in a cereal-legume rotation scheme. Use both known lines and populations. Try to relate those which do well to N efficiency use, root peculiarities, respiration efficiency and N fixation efficiency.
4. Consider the potential role of mycorrhizae in water relations and N fixation in sorghum and millet.