

43697
PD-ABU-556

BOSTID-PARC RESEARCH PROGRAM

SITE VISIT REPORTS

January 1993

Site Visit Report: Sunday, January 17, 1993

Project #1: Transfer of B.t. genes to chickpeas for pod-borer resistance

Site Visitor: Peter Day

P.I.: Professors Khan and Riazuddin
City: Lahore

I met with the PIs, together with Dr. Tayyab Husnain, Ms. Shahid Karim, and several other students. Although CAMB's facilities are by no means complete, most laboratories, a growth room, and instruments are functioning well.

Current Status of the Research Project:

Dr. Husnain reported that chickpea hypocotyl explants regenerate readily. However, attempts to transform these materials with Agrobacterium tumefaciens have only been partially successful.

Ms. Karim summarized progress in testing 400 soil, seed dust, bird dropping, and animal dung samples from throughout Pakistan. Of 127 samples processed, about 80% gave B. thuringiensis. Some 30 isolates have been tested in a biocide assay using larvae of Heliothis armigera on an artificial medium. Eight were active and one (D4-10) was 3-4 fold more so than a standard strain.

Work on refining the artificial diet is now complete, and the group is ready to assay transformed chickpeas expressing a B.t. gene when these are available.

Project Responsibilities: Professor Fazle Majid Khan has returned to the project and is responsible for the insect bioassay.

Problems: The group has not received requisitioned equipment and supplies.

What suggestions/recommendations did you make? The possibility of closer links with chickpea breeder(s) and/or other end users should be explored.

What is to be accomplished by the next site visit in September/October 1993?

Further work on mature embryo explants will be carried out in the hope of obtaining higher rates of transformation. Work will also continue with hypocotyl explants.

The group will explore the prospects of using gene guns in neighboring countries as an alternative to A. tumefaciens.

Further studies of isolate D4.10 are expected to establish whether the gene for the activity is plasmid borne, the number of plasmids, and should lead to cloning the plasmid and identifying the gene. Tests of other isolates will continue.

General: Although the PI is extremely busy, he is conversant with the project and managing it effectively. The facilities are excellent.

Site Visit Report: January 17, 1993

Project #2: Conjunctive use of water from varying quality sources on salt affected land.

Site Vistor: Jim Oster

P.I.: Dr. Tahir Hussain

CO-P.I.: Mr. Muhammad Yaseen

Graduate Students and Field Manager: see attachment #1

Current Project Status:

Construction of the field facilities--plots and plot (treatment) layout, pumps, tube well, pump house and storage room, water measuring devices--is finished; field and research staff are adequate and have 6 months of experience with site management and soil, water, and crop monitoring. A second cropping cycle has been started. Wheat is well established, but the sugar cane will need to be replanted in February.

Construction of the field facilities and the cropping schedules required extraordinary work, time, and labor management. The bulk of the work was conducted under hot summer conditions. The facilities are excellent. Photos were taken.

Irrigation Water Qualities:

canal water	EC, dS/m	SAR	RSC
canal water	0.2	___?	___?
well water	2.6 dS/m	12.0	10.4
drainage water	about 2	about 5	about 1

(I lost the information Hussain provided that included water quality data and list of

students.)

Drainage water quality varies; it is nonsaline nonsodic during the monsoon season and becomes increasingly saline and sodic during the dry season. Maximum EC 4.3 dS/m, Maximum SAR 20, Maximum RSC 16.

More definitive water quality data will become available as laboratory work is completed.

Suggestions and Recommendations:

Several graduate students are involved: the project provides opportunities for education. However, some thought should be given to how the research findings will be transferred to farmers who cannot observe the project directly. Linkages with Extension Personnel have not been made. I suggested that some effort be made to involve one, or possibly two, Extension people. The Extension/University linkages for this type of project may not exist. Extension people in Pakistan do not have advanced degrees (MSC or PhD). However, there likely are several Extension people with sufficient training, intelligence, and curiosity to learn the soil-water-crop practices required to manage poor quality irrigation waters. The opportunity to involve Extension people should be explored.

Chloride concentrations in the saturation extracts should be determined. This will facilitate evaluation of crop water use efficiency and the fraction of applied water which drains below the rootzone.

Potential crop evapotranspiration at the field site should be measured with a simple method.

Dr. Hussain's request to reallocate funds to pay for an additional 50 trips to the field

should be approved.

Analyze manure for TKN, NO₃, Na, CA, Mg, Cl and SO₄.

What Should be Accomplished by the Next Site Visit in September of 1993?

1. Summarize soil and water chemical compositions of samples obtained in 1992 and the first quarter of 1993.
2. Summarize irrigation water, rainfall, potential evapotranspiration and crop yields for the same time period.
3. U. S. visit by Hussain.
4. This cropping season should be finished and another started.

U. S. Research Visit:

Hussain should visit the U. S. Salinity Laboratory (Riverside, CA), U. S. Water Management Laboratory (Fresno, CA), and the University of California at Riverside and Davis. The purpose of this visit is to review project data with Dr. J. Rhoades (USSL and project consultant), to discuss recent findings related to sodium/calcium effects on crop growth with Drs. Mass and Grieve (USSL), to discuss results obtained from field demonstration projects related to use of poor quality irrigation water with Rhoades (USSL), Ayars (USWML), Rains and Goyal (UCD), Oster (UCR), to discuss new findings about water quality with Tanji and Grattan (UCD), and Oster and Letey (UCR). This visit will require at least two weeks in the U. S. (at least 10 working days) and should occur during the second quarter of the year, preferably in May.

Consultant Visit:

Hussain suggests that the Rhoades should visit the project near the end of the BOSTID project. I concur. The reasons are: 1) Data from several cropping seasons will be available. 2) With this data and the accumulated experience with management of the field site, Rhoades and Hussain can develop timely and knowledgeable plans for continuing the project as well as review plans for publication of the results obtained during the BOSTID project.

ATTACHMENT NO. 1

STUDENTS WORKING IN BOSTID PROJECT

<u>Name</u>	<u>Class</u>	<u>Title of Project</u>
1. M. Akhtar Abbas Ph.D (85-ag-1322)		1) Utilization of poor quality water through biological approach. 2) Utilization of poor quality water through chemical amendments.
2. Saif-ur-Rehman Kashif (86-ag-1372)	M.Sc (Hons)	Cyclic vs. Blended use of canal and Drain water for crop production.
3. M. Amjad (87-ag-1335)	M.Sc (Hons)	Cyclic vs. Blended use of canal and tubewell water for crop production.

RESPONSIBILITIES:

To conduct experiments, from sowing to harvesting, application of treatments and routine agronomic and plant protection measures and weekly field visits and soil, water and plant analysis.

FIELD STAFF:

1. Field Manager (Data Collector):

Mr. Muhammad Salam is working as Field Manager at the farm. His responsibilities include arrangement of materials for experiments, layout of the field, labour management, assist in the application of treatments of the trials, collect data and process the crop after harvest.

CHEMICAL ANALYSIS OF MADUANA DRAIN

Date of sampling	EC dS m ⁻¹	RSC me L ⁻¹	SAR (m.mol L ⁻¹) ^{1/2}
<u>1992</u>			
July	2.65	1.93	14.0
August	1.03	1.72	6.3
September	0.95	0.00	7.2
October	1.72	1.25	7.6

Site Visit Report: Monday, January 18, 1993

Project #3: Water Harvesting to enhance crop production in Highland Balochistan

Site Visitor: Dean M. Anderson

P.I.: Dr. Bakht Roider Khan
Quetta

Current Status of the Research Project: According to Khan, everything on schedule. Visited Kolpour site with stops along the 25-km trip to view additional plots. Current precipitation made travel difficult, getting stuck in mud once. Was told the most recent planting took place in October 1992. Wheat had germinated ≈ 3 " high on some plots. Typed report was presented to me by Khan.

Project Responsibilities: Strip cropping plots had been added to project. Visited site along railway, was told planting had been done in December.

Problems: Khan indicated that final replacement for his position had not been made, but person would be chosen who fostered agronomic and range values. He was quite confident something might occur before February 1993.

What suggestions/recommendations did you make? No suggestions as to altering on-going project were made. Complimented Khan on having begun project so an extra year's data will be available.

Did suggest that rain gauges (simple can) be put at each plot site to document variability in precipitation that may not be detected from single station located within each general area.

What is to be accomplished by the next site visit in September/October 1993? Proposal to be followed as approved by BOSTID.

U.S. Research Visits: Khan proposes a U.S. visit for his co-PI but not for himself, since he will be leaving. Will discuss details at meeting 1/21/93.

Payments: The third and fourth payments have not been received. Khan's project not being affected as critically as Rafique's project.

General: Khan demonstrated a most dynamic personality for working with the government system and was most concerned that his replacement would also be dynamic to further the goals he has set in place at AZRI over the past 7 years he has been there.

Site Visit Report: Tuesday, January 19, 1993

Project #4: Improved management of indigenous breeds of sheep in highland Balochistan

Site Visitor: Dean M. Anderson

P.I.: Dr. Shahid Rafique
City: Quetta

Current Status of the Research Project: Field sites were not visited due to time constraint (6 hours road travel round trip) but office visit and facilities visit at AZRI revealed no major problems. Feeding pens are now finished and ready for trial to begin at AZRI.

Project Responsibilities: No major changes have taken place.

Problems: Purchasing supplement has been delayed because getting small amounts of feedstuff in Quetta is a problem. Rafique will buy in Islamabad and have it shipped by truck or train to Quetta during January 1993. Molasses not available in Quetta. The trial to be done in Spring of 1992 will be done in Spring of 1993.

What suggestions/recommendations did you make? No changes recommended to scientific protocol. Recommended that Rafique's visit to U.S. would be most profitable if data were taken along to be worked on.

What is to be accomplished by the next site visit in September/October 1993? Lamb fattening trials in Quetta will begin later than planned.

U.S. Research Visits: Discussed. Suggested that Rafique concentrate on one location, such as the U.S. Sheep Experiment Station at Dubois ID, to get experience in laparoscopy technique, organization and analysis of lamb fattening trials, and PC SAS analysis of data. March/April 1993 proposed. Details of Co-PI visits must be discussed with Judith.

Consultant Visits: Understood David Thomas will visit again, and that his site visit in November was useful.

Equipment: Balance still not received (livestock scale). Rafique had no problem with bulk shipping procedure.

Payments/Financial: There is a problem with funds being almost exhausted. The October-December 1992 payment has not arrived.

Financial Officer: Apparently the Financial Accounts Officer is receiving 13 months salary but wants 14 months salary from both Rafique and Khan BOSTID projects. Rafique needs to discuss this administrative matter with Judith.

General: Rafique seems to have project in control but is frustrated by lack of material for supplement formulation.

TITLE: Development of an integrated pest management system for cotton in Sindh 25

PRINCIPAL INVESTIGATOR: Ahmed Ali Baloch

Last May I wrote a fairly detailed report which presented a restructured set of objectives. These objectives were derived after input by U. Baloch (PARC). U. Baloch believed that much of the research proposed by A. Baloch had already been done, and that published papers and PARC reports were available. For this reason, the first objective was to have the PI and his assistants research the existing literature at NARC on the pests to be studied, and from these references write a report on each of the major cotton pests. After this has been accomplished, the gaps in the database can be identified, and research can be more directed to filling these gaps. However, this process is contingent on the PI gaining access to the literature that U. Baloch says exists. Before the next growing season begins, the PI needs to spend as much time as needed in the reference library at NARC to make copies of existing literature. If U. Baloch could help facilitate this process, I am sure A. Baloch would be very appreciative.

A copy of the May report should be forwarded to A. Baloch. Apparently he did not receive a copy, and for this reason, and because funds did not arrive until mid-season and research was already underway, he focused his research on the original objectives. However, now that he has addressed these objectives the PI needs to focus on the objectives outlined in the May report. These objectives were developed by myself and the PI, and the PI is quite comfortable with addressing them.

The specific objectives are as follows:

1. Complete reports on the biology and ecology of the major insect pests attacking cotton in Sindh, and initiate studies in areas where data are needed on these pests and their natural enemies.
2. Identify alternate host plants of insect pests and their natural enemies, and study the pest biology on these plants.
3. Evaluate new formulations of Bacillus thuringiensis and other insecticides for controlling insect pests of cotton and their effects on natural enemies.
4. Write a general article on the biology of the whitefly, Bemesia tabaci for publication in an international journal.

Because no progress was made on these objectives this past season, it is not possible for me to make any further recommendations than were made last May. However, the PI and his assistants did complete a number of independent studies related to the original set of objectives. It is not apparent how the results

from these studies will be used in developing a biological control based IPM program for cotton. Once the above mentioned objectives have been addressed, the PI should have a sufficient database to establish an efficient sampling plan that can be used for decision making purposes in an IPM program.

I have written to Dr. Derek Campion (Natural Resource Institute, U.K.) to see if he could provide Baloch with pheromone traps for monitoring key lepidopterous pests. If the PI can identify the phenology of the different life stages of these pests and relate this to pheromone trap catches, it may be possible to use these pheromone traps for decision making purposes. However, such trap data by itself can be misleading. I have also had several biotech companies send Bt materials for evaluation.

Site Visit Report: Tuesday, January 19, 1993

Project #6: Tolerance of wheat to hypoxia and salinity

Site Visitor: D. W. Rains

P.I.: Dr. Riaz Qureshi

City: Faisalabad

The project was presented to a group meeting held in Faisalabad January 17, and a site visit was held January 19 at the University of Faisalabad. Dr. Riaz Qureshi presented information on the status of his project and reviewed future plans. On January 19, the project was visited with a review of the laboratory facilities and of the experiments being conducted in the greenhouse.

Current Status of the Research Project

A series of experiments are currently underway in the greenhouse. Various combinations of salinity and hypoxia are being used to evaluate the response of different genotypes of wheat to these conditions. The lysimeter is in operation and a number of genotypes are being evaluated under various regimes.

The results look very promising. There are differences apparent in the genotype response to salinity and hypoxia. The experiments appear well-designed, and the individual student researchers are knowledgeable of their project. The laboratories supporting the research project are well equipped and appropriate for the project. The anatomical studies are on hold until the rotor and microtome arrive.

The project is well organized, well run, and should provide significant information and biological materials on the problem addressed.

Problems

1. The project would benefit greatly if a closer collaboration could be established between this group focusing on physiology and plant geneticists/breeders. Although not a defined objective of the project, this needs to be encouraged for the long term success of the project.
2. Incomplete equipment acquisition.
3. Inadequate access to literature--a long term goal.
4. Unavailability of vermiculite.

Suggestions/Recommendations I have no specific suggestions or recommendations. The group appears to have accessed a good source of germplasm and are sending inquiries for additional genetic material.

To be accomplished by the next site visit in September/October 1993

1. Harvest all of the greenhouse material, collect and compile growth data, and do tissue analyses of plant material.
2. Select best material and plan next round of evaluation of performance.
3. Initiate anatomical studies on roots of wheat genotypes.
4. Complete visits (see next section).

U.S. Research Visits:

Mr. Shafqat Nawaz has requested a 2-3 month visit to the U.S. A visit to Rains' laboratory in July-August and to the U.S. Salinity laboratory at UC Riverside would be appropriate. The primary objective would be to train in new analytical technique: HPLC-real time kinetic studies of ion uptake and to discuss research activities.

Dr. Riaz Qureshi has requested a 2-week visit to various laboratories, including Bill Rains at UC Davis, to discuss research results.

Both of these visits should be accomplished prior to the September review.

Equipment: Microtome, glue gun, and 1/2 of rotor not received.

Site Visit Report: Wednesday, January 20, 1993

Project #7: Development of salt-tolerant varieties of wheat

Site Visitor: D. W. Rains

P.I.: Dr. Shafqat Farooq

City: Faisalabad

Dr. Shafqat Farooq provided a summary report at the joint meeting of the stress group, and this was followed by a site visit to NIAB on January 20, 1993. Dr. Farooq supplied a detailed timetable on the use of wide crosses to increase salt tolerance in common wheat and gave a tour of her laboratories, greenhouse, and field facilities located at NIAB.

Current Status of the Research Project: The project has been maintained on schedule. Appropriate interspecific crosses have been made and analyses of the F1 accomplished. Morphological descriptions have been developed, and isozyme electrophoresis of genotypes underway. Plants have been screened for tolerance and for performance in saline environments. Material is being screened in the field at BSRS, Lahore, and some material has been transferred to Dr. Qureshi's group at Faisalabad University of Agriculture for further testing. The research plan is well developed and is progressing steadily through the proposed schedule.

Problems: The acquisition of equipment appears to be a continuing concern. Laboratory space appears limited; however, new laboratories are in place and with a little effort will be fully functional. Computer with statistical packages are critical for processing of data.

What suggestions/recommendations did you make? The request to send Mr Tariq to a U.S. laboratory for training is reasonable and should take place in the summer between wheat growing seasons.

Acceleration of equipment delivery is recommended.

What is to be accomplished by the next site visit in September/October 1993?

Dr. Farooq has provided a timetable outlining her schedule for research accomplishments. She has also developed a detailed description of her operations this coming year (attached).

The interspecific crosses will have been screened for germination potential and for response of plants to salinity.

Seed will be multiplied, a number of backcrosses selfed, and the F1 germplasm developed from crossing will be backcrossed. Advanced material will be evaluated this winter and spring, and data on performance collected, including tillering potential, maturity, and K and Na analyses.

Equipment: (See above under problems)

General: Dr. Farooq has put together an active group and has developed good facilities for her proposed research. She appears to have good support from NIAB and the Director General, Dr. Naqvi. She should be encouraged to further her interaction with Dr. Qureshi and to search out cooperation with other plant breeders.

Site Visit Report: Monday, January 18, 1993

Project #8: Construction of a linkage map(s) and identification of disease resistance gene(s) in Brassica

Site Visitor: Peter Day

P.I.: Dr. Anjum Sohail
City: Lahore

I met with Dr. Sohail and Ms. Nargis Shahzadi, a Ph.D. student. Dr. Amjad from NARC and Mohammad Amjad (M.Sc. research student) were not present.

Current Status of the Research Project:

Ms. Shahzadi described attempts to regenerate plants from cotyledon petioles and hypocotyl explants. Regeneration rates were poorer than those reported by Calgene and may be due to the toxicity of cefotaxime, used to kill *A. tumefaciens* after co-culturing to effect transformation. Work with Dr. Zahoor Ahmad in Peshawar has come to a halt so that the production of backcross lines has not begun.

Bulk F₂ seeds from three F₁s of susceptible x aphid-resistant parents are available for testing for possible linkage of the aphid resistance locus (ARL) and molecular markers.

Project Responsibilities: These were reported to BOSTID in a first activity report received in Washington 12/31/92.

Problems:

There is a major problem in having no effective link with a brassica breeder. Dr. Baloch agreed, prior to the group meeting, to explore the possibility of transferring a breeder to CAMB. The incentive would be the opportunity to work for a Ph.D. In the absence of this, or an equivalent link, there is unlikely to be progress towards practical applications of the technology in Pakistan.

There may also be a problem in receiving help from others. Tom Osborne (Madison, WI) has a collection of Brassica DNA probes that will be invaluable in screening for linked RFLPs, but it is not clear whether or not these will be released. In the meantime, the PI has offers of probes from Dr. Lydgate (Norwick, UK) and may also make his own Brassica DNA library as a source of probes. This latter step would, however, delay progress.

What suggestions/recommendations did you make? Aphid resistance tests are presently carried out at NARC in Islamabad. It was suggested that the PI should familiarize himself with the assay method with a view to establishing it at CAMB. Prospects of working with breeders at Peshawar and Faisalabad were discussed but appear to be unpromising.

What is to be accomplished by the next site visit in September/October 1993?

1. By end of April 1993, PI expects to have information on resistance of three F₁ populations mentioned above to cabbage aphid (*Brevicaulis brassica*) and turnip aphid (*Liphis erysimi*).
2. F₁ lines showing resistance (ARL is dominant) will be sent to the collaborator at Calgene (Davis, CA) for production of dihaploid lines from another culture.

However, since the F₁s are bulks, from several different plants of the resistant parent, some of which may not have been homozygous at the ARL, and resistance is not an easily scored character, there is some doubt that this will work. An F₁ population that is unequivocally and uniformly heterozygous for resistance is required. If this approach fails, work on the ARL will stop.

3. Ms. Shahzadi expects to have refined the transformation and regeneration method by completing tests of different concentrations of NAA and BAP coupled with 24, 48, and 72 hour co-cultivation treatments.
4. The PI expects to have a supply of Taq polymerase for use in PCR by the end of 1993 using a construct from Jefferson (CIMBA, Canberra). However, it is not planned to use RAPDs for mapping since they are thought to be too unreliable.

U.S. Research Visits: The PI wished to visit the collaborator (Dr. Knauf, Davis, CA) to learn microspore culture and RFLP analysis between May and September 1993 but is waiting to hear whether or not there is a place for him.

Site Visit Report: Saturday, January 16, 1993

Project #9: Control of Hydropericardium Syndrome (HPS) in Poultry

Site Visitor: Peter Day

P.I.: Dr. Cheema

City: Islamabad

I spent from 10 am until 4:15 pm in discussions with Drs. Cheema, Naeed, Akhtar, and Mr. Mujeed. After lunch we spent 30 minutes to see the Animal Sciences Institute facilities and equipment. This included inspection of a newly-built room in a disused animal shed for holding broiler chicks. The discussions were frank and open with a free exchange of ideas and opinions in which the three senior scientists participated equally.

Current Status of the Research Project: Dr. Bale's site visit of October 22, 1992, identified 5 activities in pathology, virology, and epidemiology as intrinsic to the project's objective to isolate and characterize the viral agent and produce an improved vaccine.

1. The updated epidemiology questionnaire is now being reviewed by 4 regional veterinary staff who are expected to return their comments by January 23. Results from the earlier questionnaire are now in proof form for publication.
2. The next trial experiment to determine rate of lateral spread has been planned to begin in early February. Each trial will have 70 birds per group (increasing bird density from 60 per group in 1992 trial). Treatments will include 3 birds and 8 birds inoculated (5 were inoculated in the 1992 trial). Each trial will last for 8 weeks.
3. No further progress on viral isolation was reported since October 1992. Results were presented pointing to HPS vaccination causing immunosuppression. There was no response to booster shots of Newcastle disease (ND) given 5 days after HPS plus ND vaccine. The group believes that improper timing of vaccinations, i.e. not allowing temporary immunosuppression to abate, could lead to poor control of other diseases such as Gumboro and ND. However, the agent does not pass through a 50nm filter. Thus either the agent, or one component if there are more than one, is larger than 50nm in diameter.
4. Slides showing liver histopathology reveal inclusion bodies in the nuclei of some cells and hyperchromatic nuclei in other cells. Other slides reveal release of red blood cells from bloodvessels in muscle and other tissue.
5. No further studies of heart pathological changes made.

Problems:

I. Administrative

1. The investigators are remote from Washington and worry when their letters are not answered.
2. Dr. Cheema is concerned about the new bulk shipment scheme and, while hoping to help in reducing costs by picking up bulk shipments and distributing them, he cannot negotiate exemption from customs duty. This should be done by PARC officials on their behalf.
3. According to PI, BOSTID pays funds directly to a Pakistan bank in New York. Local branch has no record of exchange rate and says it has no way of establishing

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what rate was used. NARC cannot supply this information. Expenditure reports for March 30-May 31 and June 1-September 30, 1992, were submitted November 24.

4. Dr. Naeem needs an introduction to National Veterinary Services Lab, USDA, Ames, Iowa. I offered to telephone Dr. Panigraphy and/or Dr. Pierson on my return. Both Drs. Cheema and Naeem understand constraints on U.S. visits and need for justification.

II. Scientific

1. Investigators have realistic aims in respect of available resources.
2. Their priorities must be respected by PARC administrators, who have tried to divert them to other problems and neglect BOSTID project work.
3. Gel loading solution and overspeed disk were found in packing materials. Still no action on replacement rack covered in their letter of October 19, 1992.
4. No action on DCMB software package. This is urgently required.

What suggestions/recommendations did you make? Urged realism in setting target dates.

What is to be accomplished by the next site visit in September/October 1993?

1. New questionnaire to be sent to 200 broiler farms. Eight district veterinarians will assist in collecting data and will first be briefed at NARC. Dr. Akhtar expects to have collected all the answers and to have completed analysis by the September site visit.
2. Lateral spread experiments will include some evaluation of fecal material from infected birds as a source of virus.
3. Work on characterization and purification of the virus(es) will continue but is not expected to be completed by September. The gradient fractionation will be repeated with electron microscopy of components. Material held on 50nm filter and filtrate will be further examined.

U.S. Research Visits: See Problem #4 (administrative) above.

Equipment: See Administrative Problems 1 and 2 and Scientific Problems 3 and 4 above.

Site Visit Report: Tuesday, January 19, 1993

Project #10: Genetic improvement of sunflower crop for production under saline conditions

Site Visitor: D. W. Rains

P.I.: Dr. Medhet K. Hussain

City: Faisalabad

Dr. Medhet Hussain presented results of his research and progress towards meeting the objectives defined in his project to a group in Faisalabad on January 17. His laboratory and greenhouse facilities were visited on January 19.

Current Status of the Research Project: Approximately 100 genotypes of sunflower have been screened for salt tolerance using seedling stage evaluation. A number of genotypes have been grown to maturity and various parameters measured. Using the seedling stage evaluation method and a procedure for scoring tolerance, 59 out of 100 genotypes are advanced for field testing this spring. Dr. Hussain and his group have measured a number of parameters related to salt tolerance and have developed interesting leads on physiological processes related to salt tolerance. The project has accessed good germplasm with considerable variability. The data collected on various physiological parameters add considerably to the evaluation of the genetic materials.

Problems: The project does not appear to have any specific problems. As in project #6, the long term success of the program would benefit from an interdisciplinary approach. This is not, however, considered part of this specific project. Overall the project is well run and proceeding on schedule.

What is to be accomplished by the next site visit in September/October 1993? The next round of selection in the greenhouse should be completed. The material selected from greenhouse studies should have been grown out in the field and performance evaluated. Data should be collected and evaluated, with statistical analyses mostly accomplished.

Equipment: The project is developing a large amount of data, and the computer with statistical package is essential.

Site Visit Report: Wednesday, January 20, 1993

Project #11: Development of research management strategies to raise productivity of eroded areas and watersheds

Site Visitor: Dean M. Anderson

P.I.: Dr. Shahid Ahmad

City: Islamabad

Current Status of the Research Project: Shown the 16 1-meter³ ponds developed at NARC. Actual trial in ponds to begin within 7-10 days. Data to be used in model is currently being transferred into DBase IV routine.

Project Responsibilities: No major changes reported by Ahmad.

Problems: Lack of equipment received has been overcome by borrowing from other projects' resources to keep project on schedule, specifically lack of the auger.

What suggestions/recommendations did you make? Ahmad indicated the soil in the experimental treatments had 20-30% clay. I asked if the clay was a 1:1 or 2:1 expanding lattice; he did not know, but indicated the clay would be analyzed to answer this question. This information is essential, since type of clay would greatly influence infiltration and hence the final results of the study.

Suggestions for solving problems: Indicated that because of how the 16 ponds had been constructed, all could be covered and eliminate the need to calculate loss due to open pan evaporation. However, Ahmad indicated calculating evaporation loss was preferred due to lack of suitable covering material.

What is to be accomplished by the next site visit in September/October 1993? Data from 1m³ plots will be available; if computer arrives, data for watershed modeling will be entered. Phase I will be >50% complete. Phase II data base will be completed. Phase III will depend on arrival of software; once available, 3 months will be required to get model up and running. Phase IV: ponds dug, treatments applied, data collection in progress, and approximately 75% complete. Phase V will follow collection of data.

U.S. Research Visits: This has not been finalized in Ahmad's mind. Once computer and software arrive, he will decide where he should go with data in hand to learn how to efficiently optimize GIS or watershed model.

Consultant Visits: None requested, and no visits from outside scientists thus far.

Equipment: Auger for one-man posthole digger still not received. Also computer and software has not arrived.

Payments/Financial: No problems indicated.

General: Ahmad's project fits well into an ongoing NARC project and therefore will be continued beyond May 1994 with non-BOSTID funding. Ahmad appears to be quite involved with several other projects; however, he appeared to have the BOSTID project well in hand. The watershed located 70km from Islamabad has 5 previous years of data, while the site 40-45 km from the city has 10 years of data available. These data are being currently moved into DBase IV.

TITLE: Integrated Control of Insect Pests on Muskmelon #12

PRINCIPAL INVESTIGATORS: G. A. Miana and S. M. Khan

Muskmelons are a high value crop grown on stressed lands in N.W.F.P. on irrigated and non-irrigated lands. The insect pest complex within the same geographical area is different for muskmelons grown on irrigated lands versus non-irrigated lands. For this reason, the proposed studies need to be conducted under both situations.

The red pumpkin beetle, Aulacophora foveicollis is a major defoliator of newly emerged plants on irrigated lands. Muskmelon seeds are planted in mid-March on irrigated lands, and seedlings appear in early April with first fruit appearing in late June. The plant is very susceptible to defoliation from the cotyledon stage to vine initiation. In 1992, the Co-PI planted a crop in July and found that four applications of 5% Sevin Dust, applied on a weekly basis beginning at the cotyledon stage was necessary for crop establishment. Once the plant had reached the vine stage, the plant produced enough foliage to tolerate the feeding by the beetle.

Little is known about the biology of the red pumpkin beetle. No information is available on how or where it overwinters, or how it colonizes the crop, or its population dynamics throughout the growing season. However, it is not a problem on non-irrigated lands, i.e. it does not colonize the crop in high enough numbers to cause damage.

There is a complex of fruit flies that infest the fruit of muskmelon. The primary species are Dacus cucurbitae and D. dorsalis. The relative importance of each species differs on irrigated and non-irrigated lands. However, no matter where the melons are grown 100% infestation of fruit is very common. The Co-PI was able to reduce the levels of infestation to <3% with a single application of Dipterex (trichlorphon) plus molasses applied at 1 kg AI/ha. This experiment was carried-out in late August which is atypical of when melons are grown. However, this does show that a single well timed application may be sufficient to reduce damage below the economic injury level.

The Co-PI has been monitoring adult flies using baited traps. They have caught flies throughout the winter, demonstrating that the flies do not enter diapause in this area, but survive on a number of different fruit bearing plants. In irrigated areas, such plants are in abundance and probably account for the large number of flies present when melon fruit first appear.

RECOMMENDATIONS:

1. Repeat timing study for controlling the red pumpkin beetle on plantings that are seeded at the same time as growers would seed

their fields. This study should be conducted both on university land and at a farmers field. It is imperative that the PI and Co-PI get results this season, and to focus their research on one site is very risky. All treatments should begin at the cotyledon stage with 1, 2, 3, or 4 applications of Sevin 5% dust on a weekly basis to determine the number of sprays needed to establish the crop. An untreated control should be included.

2. Develop monitoring technique for adult red pumpkin beetle. I suggested they may use colored, sticky stakes for this purpose. At the same time, they need to get absolute estimates of beetles/m² by taking direct observations. This can be accomplished by establishing prearranged sample units equivalent to one square meter, and recording the number of beetles within this unit. This should be repeated 20-25 times within the field for each observation date. These absolute estimates can then be compared to the relative estimates provided by the sticky stakes.

3. Monitor fruit fly adults throughout the year using baited traps for irrigated and non-irrigated lands.

4. Collect 20 fruit weekly from irrigated and on non-irrigated lands when the fruit reach 7-10cm and place over sand. Allow the maggots to complete development, and retrieve pupae from sand. After flies emerge, identify species, so that you know exactly which species are causing the damage. Just because the flies are present, at least based on trap catches, it does not mean they are ovipositing in the melons. This information is needed for developing non-insecticidal control measures.

5. Repeat insecticide timing trials on both irrigated and non-irrigated lands. The Dipterex plus molasses provided excellent control in the late trial last season. The treatments this year should include: Dipterex, Dipterex + molasses, Dipterex + molasses + protein hydrolysate and Dipterex + protein hydrolysate, all single applications when fruit are 7-10cm long and a second set of treatments will be the same as above except that a second application of each will be made 10 days later.

6. Use red pumpkin beetle adults for conducting bioassays on different neem extracts. Adult beetles can be collected from the field all season long. Starve for 24 hours prior to conducting choice and no choice tests.

Site Visit Report: Sunday, January 17, 1993

Project #13: Selection of mesquite for production of grazable biomass and fuelwood in stressed land

Site Visitor: Dean M. Anderson

P.I.: Dr. Rafiq Ahmad

City: Karachi

Current Status of the Research Project: Visit with Ahmad took place between 9:30 and 1:15. Began with discussion in his office, proceeded to nursery, and then to field site, where I was shown the area cleared to receive seedling transplants. From 2 to 3 pm was given tour of Ghaffar's lab and cooperative work with salinity tolerance of Rhizobium. Based on 10/19/92 site visit, this thrust is scaled back.

Project Responsibilities: Shown results of successful budwood grafts and recent germination of Prosopis infected with Rhizobium being irrigated with water having different salinities. Saline well is dug except for last few feet, has taken 2 months to dig (laborers paid US\$5/day).

Problems: None were apparent. Appears protocol was being followed methodically. Documentation was neat, and I was encouraged to inspect records. Billing procedures appeared to follow suggested documentation. Some concern voiced by Ahmad and Ismail about the timely arrival of remaining equipment (3 pieces) and third installment of money.

What suggestions/recommendations did you make? Encouraged that a preference rating be given to the species/strains once planted in the field. Ahmad agreed to do this using goats at least once before April 1994. This, in lieu of analyses for whole plant chemistry.

1) **Next stage of project:** Prosopis will be planted into the field upon completion of saline and fresh water supplies becoming available. Procedure and allocation of a source of goats will be begun for 1994 trial.

2) **Recommendations for solving problems:** Many of the project concerns could be eliminated if assurance for funding beyond 1994 were possible. However, Ahmad was given a verbal approval for continued funds from PRC.

What is to be accomplished by the next site visit in September/October 1993? The cleared area is to receive transplants, the saline well is to be finished, and adequate pipe laid to distribute the water. Fresh water is to be piped to the area also for irrigation.

Other topics: Was given a tour of Dr. Ghaffar's lab in which he is studying the influence Rhizobium bacteria apparently have in retarding fungial root disease in agronomically important plants.

U.S. Research Visits: Ahmad would like to spend 15 days in Texas during 1993 to discuss topics with Felker and businesses using mesquite wood.

Consultant Visits: No discussion on this topic.

Equipment: Indicated that of the 4 pieces of equipment ordered, only the leaf area index meter has been received. Indicated this would be discussed on 1/21/93 to determine fate of remaining equipment.

Payments/Financial: First and second installments were received on schedule; third installment not received. This delay is causing serious problems. Was shown hand-dug well and was told that laborers needed to be paid but could not until funds were received. Also indicated that professional salaries were going to be affected if problem was not resolved soon. Indicated this too would be discussed on Thursday, January 21.

General: Well designed and implemented study. However, encouraged concurrent data on palatability of top producing Prosopis since Ahmad indicated fodder and fuel use was equally important as title to project indicates. Palatability tests not spelled out in original plan.

TITLE: Biocontrol of Chickpea Pod-borer 2/14/

PRINCIPAL INVESTIGATOR: B. A. Malik

The PI and the Co-PI have made good progress on this project considering that funds did not arrive until after the growing season began. They focused their research on establishing a healthy colony of the chickpea pod-borer (CPPB), Helicoverpa armigera for conducting bioassays. Their colony is very healthy and they are able to utilize a rearing procedure developed by the CO-PI. They conducted a very thorough study on determining the LC_{50} of Bacillus thuringiensis subsp. kurstaki standard (HD-1-1980) for all larval stages and two sizes within each stage. This research was necessary before further bioassays can be conducted. Their data are very good, and when combined with some other laboratory studies should be of good enough quality to be published in an international journal.

I had four different companies send formulated Bt products to be field tested against the borer. The PI and Co-PI are poised and ready to start the field season. The PI has had a 100 x 200m field planted to chickpea, and divided into 4m x 3 row plots. These plots should provide them with the means to field test formulated materials, and proper timing of these products. Because chickpeas are not a high cash value crop, they need to identify the most economical way to use the Bt's. So, by the end of the 1993 season, they should have a good handle on which materials are most effective, and how to best use them. The results from these field trials should be of value and of such quality to be published in an international journal.

Although pheromone trap data are available on flight activity of the CPPB, no data are available on the phenology of the different life stages, and in particular the phenology of life stages as relates to crop phenology. This information is critical in establishing proper timing of Bt's and relating pest densities and pheromone trap catches to yield losses/plant damage. For this reason, the PI's will use an absolute sampling method to determine pest phenology and will record twice weekly plant phenology. If pheromone trap catches can be closely correlated with larval densities, then sampling for decision making purposes can be based on trap catches and it may even be possible to initiate first sprays based on trap catches.

Another field study will be to use the most effective material to determine residual activity against the different larval stages under rain and no rain conditions. This information is invaluable in helping growers determine whether they need to retreat a field or not following a rain.

The PI's are interested in isolating new strains of Bt that may be active against CPPB. They have cultured several isolates that they believe to be Bt. However, they do not have the

necessary equipment to properly identify the isolates. They have also conducted several studies to evaluate the effects of different carbohydrate sources on crystal and spore formation. They have made a noble effort; however, the methodology they are employing is 20 years old and they do not have the equipment or expertise to have an effective program. I appreciate their concern that unless they find their own strain of Bt the Pakistani farmer is going to be dependent on some international company; however, there are no large fermentation companies in Pakistan with the capabilities of producing the Bt product even if a new isolate is found. The only way that they should continue working in this area is if they are able to establish a joint project with a biotechnology company interested in identifying, culturing and evaluating new isolates. They could do the initial screening and bioassaying; however, they are not equipped to perform the intermediate steps. The personnel could be better used for the field aspects of this project.

Site Visit Report: January 17-18, 1993

Project #15: Development of wheat and barley varieties for rotation with rice in moisture-deficient and saline soils in Sindh

Site Visitor: D. W. Rains

P.I.: Dr. Muhammad Raza Lodhi

The project was presented to the stress group meeting held in Faisalabad January 17 and an individual meeting with Dr. Lodhi on January 18. Dr. Lodhi presented information on the status of his project and presented a revised proposal and list of wheat and barley varieties currently being tested in Sindh.

Current Status of the Research Project: Dr. Lodhi has completed planting the varieties being tested in his project. He obtained a number of his varieties of wheat and barley from Dr. Hashmi, the National Director of the wheat program at PARC. The national wheat program has access to international sources of germplasm, and this will greatly increase the potential of selecting cereals that perform well in the chosen environments. Dr. Lodhi planted 30 varieties of wheat and 20 varieties of barley at two locations in Sindh. The plots were replicated to address the potential heterogeneity in the soils. Included were 7 varieties of wheat indicated by PARC as having increased salt tolerance.

The primary selection will be for tolerance to moisture deficit, since this area employs a cropping system that uses residual soil moisture to grow wheat and barley after rice. Indirectly, varieties that perform well may show enhanced tolerance to alkalinity, since these soils are alkaline in nature. The second important trait will be short duration cereals, as these varieties have to accommodate the short growing season between rice crops. Dr. Lodhi will measure germination, days to heading, days to maturity, and yield.

Problems: Dr. Lodhi did not indicate any serious problems and appears to have accessed a good source for germplasm.

What suggestions/recommendations did you make? An in-country consultant should be made available to Dr. Lodhi due to the isolation of his research sites. One recommendation is Dr. N. Hashmi, National Coordinator of Wheat Program for PARC.

What is to be accomplished by the next site visit in September/October 1993?

1. First harvest of varieties should be completed and analyses of data well along, if Dr. Lodhi is to make decisions about next winter season cereals variety test.

Project #16: Potassium and ammonia dynamics in soil and the implications for fertility management.

Site Visitor: Jim Oster

P.I.: Dr. M. Saleem Akhtar

Research Assistants:

Zahid Iqbal Awan

M. Arshad

Current Project Status:

Determinations of mineralogical composition and potassium chemistry of four soil series have been completed. During this work, the two research assistants have learned the laboratory methods which will be used throughout the project. They include: 1) identification of clay mineralogy using X-ray diffraction, 2) chemical methods for mineralogical analysis of sand, silt, and clay fractions, and for potassium availability using boiling nitric acid or ammonia acetate. Dr. Akhtar has summarized the data in a 26-page progress report. The report is well written and the data are reasonable, with the exception of silica contents. Dr. Akhtar suspects the silica lamp for the AA was not operating correctly.

Project Responsibilities:

Mr. Akhtar Ali was listed as CO P.I. in the original contract. Ali's contribution has been nil, in part because he will leave soon for further studies in the U.S. Has Dr. Akhtar received permission to change the salary budget so that he could pay for two research assistants? Dr. Baker, in his travel report, mentions the need for BOSTID approval. I was shown a copy of a FAX mailed to Dr. Bale on 10/31/92 proposing changing the staffing from one research assistant and two laboratory assistant to two research assistants. With

minor reductions for PI and CO PI salaries, the new total salary allocation was \$4644, or \$144 more than in the original agreement. He requested a \$144 increase in the salary budget. See attachment 1.

The research assistants recently received their MSc's from the Agricultural College at Faisalabad and are pleased to be working on the project. Dr. Akhtar is confident that the training phase related to potassium is completed and that he and his staff can complete the work related to the first three project objectives. As I noted in my report written in about March of 1992, the greenhouse and field studies (objective 4) cannot be completed within the two year time frame.

Problems:

I took a series of photographs to document two equipment problems. The first deals with the freeze dryer. The freeze dryer did not include four accessories: 1. a vacuum pump--another pump is available; 2. a manifold--a local machine shop made a functional manifold; 3. rubber caps for the drying vessels--a crucial accessory because there is no alternative, safe method to connect the vessels to the vacuum manifold; 4. 45° glass tube connectors.

The drying flasks, which were included in the first shipment, have a large opening on the top (# 10 - # 14 stopper). Without a means to connect the flask to the manifold they are useless. The question is: would using a large rubber stopper work? Or would the flask implode when it is evacuated? I suspect the outward force on the neck of the flask will be too great and the flask will implode. The rubber caps clasp and seal the upper neck of the flask from the outside. Upon evacuation pressure will be exerted evenly along the outside

of the flask neck--a self supporting design which permits flask construction using thin glass for the flask neck. The total cost of the rubber caps and glass tube connectors will likely be less than \$200 and they are crucial to the drying needs of the study in terms of both capacity and safety.

The second problem is that one of the six acid digestion bombs exploded in the muffle furnace. The metal failed at the base of the threads. Hydrogen fluoride fumes were released into the laboratory and the ceiling ceramic tile of the muffle furnace was cracked. The failure occurred during the third use of the bomb. Dr. Akhtar is familiar with the proper oven temperatures and chemicals to be used during this digestion step because of his experience using the technique in the U.S. For safety, he has instructed the temperature be set at 100° C instead of 150° C. He has a paper trail notifying the U. S. company (cc/Bale). During our meeting he received a letter from the company requesting details including oven temperatures, reagents, etc. I will send photographs to this company (Parr Inst. Co.; Moline, IL; Pat Malmloff, FAX # 309 762-9453) as soon as they are available.

His requests for additional equipment have been denied. Total expenditures as of 10/22/1992 were \$9,121.43 as compared to a budgeted amount of \$31,600. We were not sure if the chemicals were ordered in the meantime. But even if they were, we estimated their costs to be less than \$4,000.

Payments/Financial Records:

I reviewed the expense and receipt documents. The file for each purchase is complete beginning with the description of the item to be purchased, bids from vendors if the cost exceeded 5000 rupees, receipts, and bank records. Every item is numbered and the number

is traceable throughout the records. All records for a given purchase are assembled into a single packet. If checks were issued to research assistants to purchase the equipment, the paper trail is complete: bill, receipt, and check.

The second financial report does not do reflect this degree of documentation. I recommended an amended financial report be prepared and submitted so that items purchased by research assistants be documented in terms of item description and cost, and check number. During the Peshawar group meeting, Dr. Bale provided several examples illustrating how to organize the report and what needed to be included.

U. S. Research Visit:

Dr. Achtar wants training in the use of specific ion electrodes to determine quantity/intensity relationships for potassium. Dr. Duncan Scott (Professor Emeritus, Iowa State University) has recommended two universities to Dr. Achtar in writing and to me by phone on 28 Jan. 1993. His top recommendation is Drs. Meng Huang and Rich Farrell, Un. of Saskatchewan, Saskatoon, Canada. The less preferred recommendation is Drs. Wang and Evangelou, University of Kentucky at Lexington. Go with the top recommendation provided this is permissible to BOSTID. I have not contacted these researchers.

U. S. Consultant:

I spoke with Dr. Dixon on 28 Jan. 1993, Dr. Achtar's major professor and the person Dr. Achtar prefers. Dixon and I reviewed the situation with regard to active research programs related to potassium and ammonium underway in the U. S. As expected the list is limited. Dr. Sawhney at Connecticut and Dr. Sparks at Delaware and Dr. Dixon have

published papers in the field and are still active. Of these Dr. Sparks and Dr. Dixon have done the most recent work, with Dr. Dixon having the longest track record in the clay mineralogical aspects of potassium and ammonium availability.

Question Related to U. S. Training:

Can travel and expenses for travel to the U. S. include passage through Adelaide, Australia? Dr. Achar has two accepted papers to be presented to the 10th International Clay Conference (May or June, 1993. Sorry for not knowing the exact dates.) Although related to the BOSTID project, they do not include BOSTID project data. The titles are: 1) Micaceous mineral transformation and potassium availability under rice-wheat rotation and 2) Mineralogical characterization of a glauconite sandstone from Pakistan.

Equipment needs:

L Gage (PN: 401258P1; Attachment # 2). This is an alignment gage for the X-ray diffractometer needed to increase accuracy at low scatter angles.

Specific ion electrodes for potassium, sodium, calcium, and chloride. Electrodes need to fit a Fisher Scientific Accumet Model 950. He does not need a meter.

Thermocouple for Beckman Spectrophotometer, Beckman Model IR 4260. Part # 563686.



SOIL MINERALOGY SECTION
LAND RESOURCES RESEARCH INSTITUTE
NATIONAL AGRICULTURAL RESEARCH CENTRE
ISLAMABAD 45500, PAKISTAN

Ref. No. _____

Date 16/11/92

To: MS Judith Bale
Co-Director
Pakistan Research Program (BOSTID)
2101 Constitution Avenue
Washington, D.C. 20418 USA

From: Dr. M. Saleem Akhtar

Reference: PAK-SS-PB-16

Subject: PAYMENT OF \$136 TO DIANO CORP FOR SUPPLY OF 'L' GAGE,
PART NO. 401258P1

The part mentioned in the subject is urgently needed for X-ray diffractometer alignment. Please pay \$ 136 to the company at following address:

DIANO CORPORATION
30 Commerce Way
P.O. Box 1005
Woburn, Massachusetts D1801 USA
Phone (617) 935-4310. Telex 94-9306.

M/S Link Pakistan which conveyed the price is their sole dealer here. Please have them sent the part directly to the under signed.

Question: why not purchase it in Pakistan?
Answer: Price could double because of import duties. *O/C*

M. Saleem Akhtar
(Dr. M. Saleem Akhtar)
P.I. BOSTID Project

~~THE BID OF~~ ^{is} THE PRICE OF \$136.0015 A 1992 ~~BE~~ PRICE QUOTE

From: Dr. M. Saleem Akhtar

Hand Delivered

Subject: AMENDMENT IN POSITIONS AND SALARIES OF PAK SS-PB-16.

It is submitted that following posts under Grant PAK SS-PB-16 have been provided.

1. Research Assist \$ 1920 per year
2. Laboratory Assist \$ 720 per year
3. Laboratory Assist \$ 720 per year.

It is proposed that both the positions of Laboratory Assistants may be merged into a new position of Research Assistant. The proposal has approval of Chairman PARC and appointments have been made selecting M.Sc.(Hons.) Soil Science persons (Flage "A"). Both devote 100% time to the project.

2. New salaries of PI and Co PI will be following:

- P.I. \$ 260
CO. P.I. \$ 160

The new salaries are lesser then originally proposed one's and are according to GOP rules.

3. Keeping in view pera 1 and 2 new proposed Salary for the 1st year will the following

<u>Position</u>	<u>Salary</u>	<u>New Salary</u>
	\$	\$
PI	340	260
CO PI	216	160
Research Assistant	1920	2112
Research Assistant (previously two Lab. Assistant)	1440	2112
Total	<u>3916</u>	<u>4644</u>

Salary allocation in the grant documents is \$ 4500 and there is short fall of \$144.

4. Therefore an increase in the Salary head by \$ 146 is requested.

(Dr. M. Saleem Akhtar)
Project Incharge (BOSTID)

cc: Dr. Balouch, PARC

TITLE: Insect pest management in stored grain and in the rice crop using botanical products (#17)

PRINCIPAL INVESTIGATOR: G. Jilani

Because of some confusion in the transfer of funds, the PI did not initiate this project until the first of January 1993. Some preliminary work has been completed. A survey of Sindh province was conducted to select sites for farm level storage trials using botanical materials. Sites at the Rice Research Institute (Dokkri) and Rice Research Station (Thatta) were selected. Ten bags of rice (IR-6 variety) each containing 100 kg of rice grain have been purchased from local a market. The bags have been enclosed in a polyethylene cover and fumigated with Phostoxin, so that all bags are free of insect pests. The treatments will be compared against an untreated control and the polyethylene/phostoxin treatment will be the standard. The treatments will include neem oil, turmeric oil and sweetflag oil. A sprayer for treating the bags of rice has been purchased and a mixer for treated rice grain has been built.

The revised objectives are:

1. Evaluate biological activity under laboratory conditions of botanicals and a marine animal against stored grain insects.
2. Determine efficacy of botanicals for controlling stored grain pests on bagged rice.
3. Evaluate efficacy of botanicals for controlling insect pests of rice under cultivation.
4. Identify active ingredients for crude extracts that show biological activity against stored grain insect pests.
5. Determine mammalian toxicity of chemicals identified in objective 4.
6. Formulate active ingredients from botanicals to be used as botanical insecticides.

The first four objectives are attainable within the time-frame of the funding period; however, it is doubtful enough time will have lapsed for objectives 5 and 6 to have been addressed.

Site Visit Report: Wednesday, January 20, 1993

Project #19: Contribution of BNF to rice grown on salt-affected soils

Site Visitor: D. W. Rains

P.I.: Dr. Kauser Malik

City: Faisalabad

Dr. Kauser Malik provided an oral report on his research project to the stress group and a site visit to NIBGE was conducted on January 20, 1993. A tour of the laboratories at the newly completed institute was followed by a more complete discussion of the project.

Current Status of the Research Project:

N₂-fixing bacteria associated with roots of salt-tolerant rice have been isolated and identified and ARA completed. IAA production has been determined on these bacteria, and the bacteria strains were reinoculated on rice roots. Root morphology was observed.

Salt tolerance of Azolla species has been evaluated, and two species were identified as having greater tolerance than the other four tested.

The potential interaction between Azolla and rice-rhizosphere N₂-fixing bacteria was evaluated, and little effect was found.

Problems: Primary constraints involve receipt of equipment and supplies, including root scanner. Training of co-PI request has not been finalized.

What suggestions/recommendations did you make? Research should be scaled up as soon as material showing promise is identified. The expression of observed traits in controlled conditions may be altered under the environments found in agricultural systems.

What is to be accomplished by the next site visit in September/October 1993?

Colonization of N₂-fixing bacteria will be expanded. Selection of Azolla for salt tolerance be continued and mixed cultivation of Azolla and N₂-fixing bacteria will continue and data collected for analysis during this period.

Effect of sodicity on Azolla will be evaluated, including growth and N₂-fixation.

General:

The newly completed institute contains excellent facilities with a research staff that appears to be dedicated and goal-oriented.

The project needs to be closely linked with programs focused on applied, adaptive research as a means to sharpen the objectives stated in the proposal.

Site Visit Report: January 20-21, 1993

Project #20: Development of protoplast technology for genetic manipulation of indica rice

Site Visitor: Peter Day

P.I.: Dr. Yusuf Zafar
Faisalabad

In addition to the PI, who had just returned from a three-month visit to Perugia, Italy, I met the co-PIs Abdul Wajid and Zahid Mukhtar, both of whom are also Ph.D. candidates. All three had travelled to Lahore for the group meeting and drove me with them on their return to Faisalabad. I also met with Dr. Kauser Malik, Director of NIBGE.

Current Status of the Research Project:

Protoplast regeneration: Initial problems of contamination in the laboratory at NIAB have been solved with the move to NIBGE. Although cell suspensions of two indica lines give good protoplasts, none regenerated plants.

For the wild rice species there have been severe problems because of a very limited seed supply, coupled with low germination rates in several cases. For two species with enough seed, Mr. Mukhtar has attempted to improve callus induction frequency by trying various hormone and cytokinin levels. Attempts to isolate protoplasts from callus were unsuccessful because cellulase RS (used by most U.S. investigators but made in Japan), requisitioned from BOSTID in August and justified by fax in September, has not arrived. Attempts were also made to isolate protoplasts from leaves of Q. rubripogon but yields were too low.

Plant transformation: First attempts using PEG to transform indica protoplasts with the Commercial plasmid PBS2sk+ with a constitutive actin promoter were unsuccessful.

Project Responsibilities: These remain essentially unchanged; however, the absence of the PI and plans for each of the two co-PI's to visit labs in the U.S. or U.K. will cause inevitable delays.

Problems:

Non-arrival of cellulase RS is noted above. Although misunderstandings on availability of funds to be spent in Pakistan have been cleared up, they have only just requested local bids for the laminar flow hood.

I was shown the foundations and steelwork for a new greenhouse at NIBGE with pad wall evaporative cooling. This will be needed for generation of immature rice embryos as a source of tissue explants. The greenhouse is unlikely to be finished and operational before October '93.

What suggestions/recommendations did you make?

Dr. Farooq at NIAB is interested in rice wide-species crosses involving some of those used in this project. It was agreed that she could provide additional materials for comparisons; however, the prospects for profitable collaboration appear slim. I also urged Dr. Zafar to have more frequent discussions with Dr. Afsar Awan who, I was told, is a successful rice breeder at NIAB and who has support from Rockefeller. This is important in

refining ultimate objectives for technology transfer.

What is to be accomplished by the next site visit in September/October 1993?

- (i) Mr. Wajid expects to have isolated embryogenic calli from the indica cultivars Bepak and D25 and to have tested the morphogenicity of protoplasts from suspension cultures derived from them.
- (ii) Will continue work on the effects of hormonal concentrations and begin experiments with 4 of the remaining cultivars originally selected.
- (iii) Mr. Mukhtar expects to try isolating protoplasts from 60-hour-old roots--reported by Helgerson as a promising source.
- (iv) The group is exploring the possibility of using an inexpensive gene gun designed by Golf (Davis, CA) from whom drawings are available to guide local construction.

U.S. Research Visits: Both co-PIs are planning visits: Wajid to learn the the biolistic method in Beachy's lab at LaJolla and Mukhtar with Cocking in Nottingham, U.K. to work on protoplast isolation and regeneration. I suggested the Wu lab at Cornell as an alternative for the first and offered to call Wu on my return. I also offered to call Helgerson, in Madison, WI, who had been approached by Judith Bale in October 1992.

Equipment: See problem with cellulase RS under "Current Status" above.

General: The team is keen and benefitting from improved facilities and a more stimulating environment. Prospects for short-term (3-5 year) benefits to rice breeders are not high.

Site Visit Report: January 18, 1993

Project #21: Developing a Fertility Management System for Eroded Lands

Site Visitor: Jim Oster

P.I.: Dr. Amanullah Bhatti, Peshawar

CO P.I.: Mohammad Jamal Khan

Research Officer: Mr. Farman Ullah (England in Sept ?)

Lab Assistant: Mr. Fareed Ullah

Research Fellow: Mr. Fida Hussain (MSc)

Current Status of the Research Project:

We visited the site on 18 Jan 1993. The field site located near Thara (See 1992 Progress Report) is about 3 hours from Peshawar. The field (about 2.7 ha) slopes (5 - 10%) towards a stream and is split into two fields, each about 50 m wide and 270 m long. The slope is oriented along the long side of the field.

The subplots for the fertility trial during the 1993-94 cropping season will be located along four transects, each of which are oriented parallel with the slope and perpendicular with the stream. Soil samples were obtained at the future subplot sites before the 1992-93 cropping season. There are two subplots per soil sampling site. Wheat, which is currently growing, will also be grown during the 1993-94 season.

The current wheat crop was uniformly fertilized (See December 1992 Progress Report). During the 1993-94 season, one subplot at each site will be fertilized using rates based on the soil test results for the site. The other subplot will be fertilized at the average rate recommended for the entire field. Paired "t" test and spatial trend analysis (Geostatistics) will be used to analyze the 1993-94 data.

This design takes advantage of new statistical techniques which may be quite useful for fertility experiments where soils are variable and where experiments are conducted on large fields managed by farmers. We should consider testing this technique in the United States.

Project Management:

The project managers have successfully met tight timelines imposed by cropping constraints. The field and farmer were selected carefully. The farmer walked out to meet us--he was unaware we were coming. He was keenly interested in what we thought about the crop.

Soil sampling was finished in advance of planting and the project managers supervised the planting of the subplots. Fertilizer was applied uniformly to the entire field area before seeding. The plots were marked and the same weighted amount of seed was broadcast by the farmer on each subplot. There is some crop variability which is good because the 1993-94 experiment requires variability to be successful.

Problem (See December 1992 Progress Report):

A request for the allocation (reallocation?) of some funds within the budget for equipment was sent (Date?) but reply is still awaited. Therefore no equipment could be purchased so far.

Accomplishments by September 1993:

The following will be completed:

- 1) 1992 soil samples will be analyzed and data analysis will include the following:
 - a) Correlation between soil properties and wheat yields
 - b) Summary statistics of soil properties and wheat yields
 - c) Geostatistical analyses to identify spatial variability
- 2) 1992-1993 crop yields will be available and statistically analyzed.
- 3) 1993-94 fertility treatments will be planned, or in other words, the
PI's will be ready for the 1993-94 planting season.

Also, infiltration rates on selected subplots may be measured by ring infiltrometer or by sprinkler-rainfall simulator (preferred method).

Overall Assessment:

New mathematical techniques are being combined with old fertilizer trial techniques in a unique way which may be useful for U. S. Researchers. This project has the potential of being exceptionally good.

Site Visit Report: January 19, 1992

Project #22: Improving Crop Productivity and Soil Fertility on Marginal Lands.

Site Visitor: Jim Oster

P. I.: Dr. Mir Hatam
CO-P.I's: Dr. Aslam Khan
Dr. Muhammad Jamal
Prof. Sherin Khan

Research Officer: Mr. Muhammad Sadiq

Research Fellow: Mr. Abid Karim

Current Status of the Research Project: Ref; Dec. Progress Report and site visit.

Previous recommendations of site visitors were considered but not adopted. The recommendation was to drop the NP fertilizer trials and objectives and to expand the experimental trials involving manure. The important question for dry land agriculture is what balance between legume crops, inorganic fertilizer and manure is sustainable. Production records of manure are not available but likely insufficient to maintain adequate nitrogen levels in the soil if productivity potentials are to be increased. Researchers in Pakistan have good reason to believe that N and P levels are limiting crop growth on dryland soils. If food production for humans becomes an urgent goal of Pakistan in the future, manure supplies will decrease as the fraction of food consumed by humans increases.

The researchers also needed to have a controlled input fertility trial. Manure compositions are highly variable. The nitrogen level is particularly variable because degree of composting and nitrate leaching from compost heaps both affect the nitrogen content. In addition a one-time manure application without providing inorganic nitrogen could upset the C/N ratio to an extent which DECREASES nitrogen availability particularly for

manures which are high in straw.

Thus, in my opinion, the researchers were correct in rejecting the recommendations of the previous site visitors. Knowing how to manage the balance of nitrogen, phosphorus and potassium inputs from manure (NPK), leguminous crops, and inorganic fertilizer to sustain high yields in dryland agriculture likely is the most cost effective method to increase food production in Pakistan.

Progress:

Both the manure and NP trials are underway. Chickpea (legume) and wheat are growing well. The project team appears to have the management well in hand.

Recommendation:

- 1) Determine if nitrogen fixation has occurred by appropriate methods.
- 2) Increase "information transfer" activities through farmer field days with or without help of Extension personnel.

Project Accomplishments by September 1993:

Crop and soil data will be statistically analyzed and summarized.

Problem:

See letter from Hatam to Bale requesting budget reallocation or augmentation to cover costs for relocating one of the experimental sites.

TITLE: Control strategies for Maydis leaf blight of maize 423

PRINCIPAL INVESTIGATOR: Shabeer Ahmad

The primary objective of this research project is to evaluate and identify new varieties of maize that is resistant to southern corn blight (SCB), is a short season cultivar (90 days) and has acceptable yield. In 1992, 16 cultivars were evaluated and several showed acceptable levels of resistance to SCB; however, these were 100 day cultivars and will not be accepted by farmers. The PI also evaluated several fungicide treatments, and demonstrated that when properly timed fungicides could protect susceptible cultivars. The cost of each application was about 300 rupees/ha. And, to be effective, two applications were needed. The PI has also completed a survey of 5 districts showing levels of severity ranging from 0.6 to 4.4 (on a scale of 0-5, with 5 being most severe).

Presently, farmers plant open pollinated cultivars which genetically become contaminated within one season. In effect, the N.W.F.P. maize production areas provide one large "variety trial." The PI and his collaborator (Dr. Saleem, plant breeder) were encouraged to collect seed from farms where low levels of severity of SCB was found, and to include these germ lines in their trials.

The short-term efforts should be concentrated on evaluating and identifying existing cultivars or accessions showing acceptable levels of resistance to SCB and other diseases endemic to Pakistan. The PI is receiving germ plasm from NCSU and CIMMYT (Mexico and Thailand). The PI has requested germ plasm from NARC, and as yet, he has not received such material. U. Baloch could help in this matter. It is doubtful that in the short duration of the BOSTID program that the PI will be able to identify any existing cultivars that meet all of the criteria necessary to meet farmer expectations. For this reason, it is imperative that the PI continues his close collaboration with Dr. Saleem. Dr. Saleem has an outstanding maize breeding program and has developed several lines that have performed very well in trials conducted throughout the world. The major drawback is they are 100-105 day cultivars. Any promising materials found by the PI will be given to Dr. Saleem for further breeding purposes.]

The major constraint in this program is that even if the PI and Dr. Saleem find an outstanding cultivar, or are able to develop one, it is all for naught unless a seed company can become involved in increasing seed production. This would require the production of hybrids, so that it is financially worthwhile for a company. Apparently, this is a problem for all open pollinated vegetables and vine crops.

I think the PI and Dr. Saleem are an excellent team for addressing this important research area. They also identified several other constraints for maize production. Proper control of weeds would increase yields by 25-40%. Very few farmers use

herbicides, yet an investment of 300 rupes/acre for atrazine (herbicide) may provide such returns. Once the grower has seed, usually from last years harvest, the next priority is to buy urea and superphosphate, then insecticides for controlling the stalkborer, Chilo pertallis, and herbicides are last on the list.

A complete maize crop management program needs to be developed and demonstrated to growers. It is important that extension personnel are involved in the development of this crop management program, so that they take a personal interest in the deployment of such a program.

Site Visit Report: January 17 and 21, 1993

Project #25: Selection of cotton varieties tolerant to salinity

Site Visitor: D. W. Rains

P.I.: Dr. Akhtar Nawaz Khan
City: Dera Ismail Khan

The project was presented to a group meeting held in Faisalabad January 17, and a site visit in Dera Ismail Khan was held January 21, 1993.

In Faisalabad, Dr. Akhtar Khan presented information on the status of his project and reviewed future plans. The next day this reviewer met with Dr. Khan and co-PI Mr. Muhammad Khan and discussed in detail the current status and future emphasis of the project.

Current Status of the Research Project:

Dr. Khan has completed one round of selection for salt tolerance in culture solution system and sampled plant material for chemical analyses. He made observations on performance of cotton varieties in the test and has determined that the screen system was functioning; however, he indicated that it is necessary to repeat the cycle. I agreed with his conclusion after determining that this experiment will be done simultaneously with the pot and field screening experiments so as not to lose any time. He has made preliminary decisions on varietal performance.

Dr. Khan also had varieties of cotton in the field for initial observations. This experiment demonstrated that heterogeneity was a problem and it was necessary to redesign his replication blocks to reduce this problem.

The pot screening experiment will be initiated this spring to coincide with the cotton growing season.

Problems:

1. Heterogeneity of field sites--this has been addressed by altering field plot design.
2. Has not received flame spectrophotometer. Is currently storing plant samples. Will attempt to find alternative site for analyses but needs information so as to plan further experiments.
3. Time -- this is addressed in next section.

What suggestions/recommendations did you make? The short time remaining will place restrictions on original plan. It was suggested that Experiment #2 (K:Na ratios) be scaled down and that information on K-Na content of tissue be collected from plants used in the screening experiments. If results obtained from the earlier screening experiments show interesting results, then a scaled down version of Experiment #2 could be attempted, time permitting. The immediate delivery of the flame photometer is essential in making this decision.

What is to be accomplished by the next site visit in September/October 1993?

1. Second screening using solution culture.
2. Analyses of plant tissue from these two experiments -- if equipment is delivered soon.

3. Completion of pot and field experiment with observations on performance of cotton varieties under saline conditions. Tissue samples collected for K-Na analyses.

U.S. Research Visits: One month visit to U.S. to visit U.S. Salinity Laboratory in Riverside, CA, and to visit Texas A&M. At Riverside he will discuss refinement to screening technique with Dr. Maas and Dr. Shannon. At Texas A&M he will visit Dr. Kohl and collect cotton germplasm and discuss characteristics of selected germplasm. This trip should be done within next two months if it is to assist Dr. Khan in his research project for the coming year. I think it will be a useful and productive trip.

Equipment: Flame Spectrophotometer. We also discussed design of net house when I visited the Dera Ismail Khan site.

Site Visit Report: Saturday, January 16, 1993

Project #26: Manipulation of Dera Ghazi Khan rangeland to improve the productivity of local livestock

Site Visitor: Dean M. Anderson

P.I.: Dr. Fatah Ullah Khan
Islamabad

Current Status of the Research Project: Objectives 1 and 2 are currently implemented. The large-scale reseeding will be done, and seed mixture will contain a mix of plant life forms, including grasses, legumes, and shrubs. Exact species not absolutely set at this point.

Project Responsibilities: Was not aware of any major changes from previous available reports. However, I believe an on-site visit by the reviewer might be very helpful to the scientists as the project is implemented.

Problems: Travel to main research site is 300 miles from Islamabad. Assurance of future funding to monitor management system over wet and dry years is essential to determine practical value of reseeding approach to enhance productivity. Scientists need encouragement to voice this concern to PRC or others with potential to help.

What suggestions/recommendations did you make? To obtain, if available, past and concurrently present and future precipitation data on rakhs.

Since limited time and funds encourage project to concentrate on end of season data and substantially reduce objective 3 to concentrate only on a preliminary selectivity trial.

- 1) Recommendations for next stage of project: efforts should be focused on end of season plant and animal data due to limited time and money.
- 2) Recommendations for solving problems: Will speak to Rex Piepco, NMSU, and go over method for sampling end of season standing crop to assure methodology is optimal. Asked researchers to consider reseeding in terms of below-average precipitation years. Barrow's gully seeder discussed.

What is to be accomplished by the next site visit in September/October 1993? Discussed survey of range vegetation on rakhs to continue, reseeding of large areas with concurrent exclusion of livestock for adequate establishment.

Consultant Visits: Khan and Butt were pleased that a person trained in range was currently visiting to make site report. No specific request was noted for consultants.

Equipment: No specifics discussed, but wonder if recording rain gauges for rakhs being evaluated should not be considered since value of the research is so closely tied to precipitation evaluation.

Payments/Financial: Not discussed, no problems.

Project #26 - page 2.
1/16/93

Implementation: Area of use requires socioeconomic evaluation to insure implementation of results at practical level. It is women, for the most part, who tend the livestock; therefore, extension efforts should be focused towards them on principles of how NOT to overgraze areas, especially when reseeding offers substantial returns based on preliminary results shown in site visit narrative.

General: Appeared to be good cooperation between Khan and Butt, and between them and others at their research location. Communication among USAID projects limited due to Pakistan infrastructure, phone, roads, etc.

Site Visit Report: January 21, 1993

Project 27: Development and Transfer of Farming Systems for the Rod-Kohi Area.

Site Visitor: Jim Oster

P.I.: Dr. Hamid Ullah Khan

CO P.I.'s:

Agron. Dr. Inayatullah Awan

Engr. M. Azam Khan

Mr. M. Ayyaz Khan

Current Status of the Research Project:

One field experiment with wheat and chickpea is underway. Treatments include tillage depth (method), crop variety, and planting method.

In the chickpea experiment, the CM72 variety is growing better than the local variety. The chisel (60 cm) and disk plow (45 cm) treatments may be better than moldboard plow (30 cm) and cultivator (15 cm). Planting method doesn't appear to make any difference. These judgments could be wrong as several months remain before the plants are ready for harvest. Differential effects on crop growth due to treatment differences could become more pronounced with time, particularly if they affect rooting depth and hence the amount of water available for crop growth.

Chickpea: recommendations for the 1993-94 season. 1) Plant only CM72. 2) Use only one planting method, probably by flat sowing. 3) Use all tillage treatments, but do not use a random block design. Rather, use a strip design with each strip, oriented parallel with the short dimension of the plot, tilled by the same method. The objective is to simplify the design so the farmers can easily compare one tillage method with another. 4) Fertilize two narrow strips across the tillage treatments using recommended rates of N, P, and K.

In the wheat experiment a planting density mistake occurred: the Pirsabak-91 variety was planted at a low density whereas the local variety was planted at a high density. The

influence of planting density on yield could adversely affect the yield of the local variety because of increased water use during early stages of plant growth and decreased water availabilities for pollination and grain filling stages of plant growth. The opposite trends in water availability could occur for the Pirsabak-91 variety. In addition, a low planting density will enhance tillering.

We concluded that planting and tillage methods were not evident on January 21.

Wheat: recommendations for the 1993-94 growing season: 1) Because of the plant density error, both plant varieties need to be planted during the 1993-94 season. 2) With exception of planting both varieties, the experimental plan for wheat and chickpea should be the same. This includes the two fertilizer strips.

Wheat and Chickpea: recommendations for the 1992-93 and 1993-94 season: 1) Determine the mass of roots per gram of dry soil in the 0-15, 15-30, 45-60, and 75-90 cm depth intervals at end of the growing season. 2) Attempt to arrange measurement of bulk density distribution with depth (5 - 90 cm) using gamma beam techniques through Dr. Seelim Akhtar of NARC, Islamabad. If such arrangements are possible, bulk density should be determined at planting and harvest. This equipment is expensive, rugged, and has a moderately high radioactive gamma source. Consequently, it should be transported and used by employees of NARC with clear agreements with regard to who can handle the source and, although the likelihood of equipment breakdown is small, to possible repair costs as well.

The #1 recommendation is more important than #2 because the rooting depth and distribution will be the largest determinant of water availability for plant growth. The second recommendation may have some merit because of possible tillage-depth and rooting-depth interactions. Tillage could result in lower bulk densities thereby enhancing root growth.

Tillage affects on bulk density will decrease with time, particularly if the soil becomes wet. When wet, consolidation occurs because of the increasing soil weight with depth. Thus differences in bulk density resulting from different tillage treatments will decrease after irrigation.