

Afghanistan-Pakistan Activities  
Quarterly Report XXVI  
(January-February-March 2009)  
Sustainable Development of Drylands Project  
IALC-UIUC

SUMMARY OF ACCOMPLISHMENTS AND FORWARD PLANS

Our major activity completed this past quarter was the January 6 - 25 Temporary Duty Assignment (TDY) in Pakistan and Afghanistan. The itinerary and scope of work for this TDY was included with our previous quarterly report. This January 2009 travel was completed by the Component Manager (Dr. John W. Santas) and the Component's Senior Advisor, Dr. Oval Myers, Jr. Our trip report has been submitted and is posted on the project's website.

During this TDY major progress was made toward accomplishment of two activities that are set forth in our FY09 Scope of Work. The first item receiving our attention was "Delivery of customized training programs in Afghanistan". Our trip report provides background and context for what will be the final installment in a comprehensive assortment of training offerings that were begun in August 2003. A description of plans for the next program follows.

The topic we have selected is "Research and Demonstration Methodology and Interpretation". This hands-on, field-oriented course is planned for delivery at four locations in Afghanistan: Herat, Mazar-e-Sharif, Jalalabad and Kabul; during April and May 2009. Six days of instruction will be presented at each location. A maximum of 20 participants will be invited to each course. Each group will be a carefully selected blend of participants from ministries, universities, NGO's and other cooperating organizations. The lead instructor will be Dr. Paigham Shah, an NWFPAU Professor who has lectured and written extensively on this topic. Prof. Dr. Shah will be assisted by Afghan scientists who have project involvement and useful contacts at each location. Dr. Shah has prepared a detailed description of the "Training Workshops" that he will lead. The course description is included with this report. This training will be completed during the upcoming quarter. The outcome and results will be presented in our next quarterly report.

The other item in the FY09 Scope of Work item that received our attention during this TDY was the challenge to "Strengthen the international dimension of the NWFPAU". It became clear during the Pakistan portion of our travel, that NWFPAU leadership is committed to the establishment of an international office as part of their administrative structure. One example of this commitment is the fact that Professor Dr. Farhatullah has been given leadership responsibility for the NWFPAU's international dimension. He also has administrative responsibility for the "University Linkage Activities" that are being funded by the Government of Pakistan's Higher Education Commission (HEC). With encouragement coming from HEC and with leadership provided by Dr. Farhatullah, the tripartite Memorandum of Understanding (MOU) linking the NWFPAU with UIUC and SIUC has been extended for another five-year period and will be in force through 2014. The MOU has been signed by NWFPAU officials and is on its way back to Illinois. Extension of this agreement is among the most significant outcomes of our TDY.

The group of ten MAIL employees continue to make good progress as they near the end of their degree programs. According to the latest information, nine students in that group will have all M.Sc. requirements completed at the end of the 2009 spring semester and their degrees will be conferred at the June convocation ceremony. The tenth individual will need additional time. We are pleased that these graduates can soon return to their responsibilities in the Extension Department of the Ministry of Agriculture, Irrigation and Livestock (MAIL). We are also pleased that the initial planning for this training effort has turned out to be quite sound. The \$266,692 grant awarded to UIUC by MAIL is nearly exhausted, but will be sufficient to train these ten advanced-degree Extension Specialists who will meet critical staffing needs in the Ministry.

During this quarter the 17<sup>th</sup> and final modification of the University of Illinois/University of Arizona subcontract was executed. This modification formalized the budget and scope of work for FY09, which will keep this component operational until the September 30, 2009 expiration of the USAID/IALC Cooperative Agreement. This process was initiated by the September 4, 2008 UIUC submission of a budget and scope of work to Arizona. On January 21, 2009 this modification was signed at Arizona and on February 10, 2009 it was signed at Illinois.

## **I. TITLE**

### **Training Workshop on**

### **Research and Demonstration Methodology and Interpretation**

## **II. ESTIMATED DURATION OF THE TRAINING WORKSHOP**

**= Six working days at each location**

## **III. RATIONALE: NEED FOR THE TRAINING**

The economies of many under developed countries like Afghanistan are based on agriculture. Agriculture research is needed to increase crop productivity for food security, poverty alleviation and improving the standards of living which lead to peace and prosperity. Thus agriculture research is essential for development of agriculture and for the benefit of the farming community. However, the benefits of agriculture research, in the form of more food, cheaper prices of food commodities, better quality, and extended availability of the crop products, accrue to all members of the society including non-farmers. There is a great scope for improving crop productivity through increasing institutional capability for agricultural research.

For the pursuit of generating knowledge and solving problems impeding development, the scientists use scientific methods. Generally, the scientific method involves observation, formulation of hypothesis, planning and conducting experiments, recording observations, statistical analysis of the data, correct interpretation, drawing valid conclusions, and formulating appropriate recommendations. The results of research must be extended to end-users through on-farm trails and demonstration plots so that farmers adopt the newer finding for solution of problems and for increasing farm productivity.

Agriculture experimentation is one of the steps of scientific method and an important tool for agriculture research. Like the buildings are designed and then erected, agriculture experiments must be properly designed before they are conducted in order to get unbiased results and valid conclusions. Most books on experimental designs and applied statistics contain a lot of material on statistical analysis of the data but have very little material on proper stepwise procedure for planning/designing experiments. Sophisticated statistical analyses of the data will not make up for the deficiencies of badly designed and poorly conducted experiments. Expertise on designing experiments in a proper way is lacking in most agricultural research systems and agricultural education institutions for higher studies in a majority of the underdeveloped and developing countries as well as in some quarters of developed countries.

Not only proper designing of the experiment is important, but it is also very important to conduct the experiments in a manner to have the required precision and accuracy. To avoid the chances of failure of the crop experiments, avoid obtaining unreliable data, and reduce the chances of less reliable results, the scientists must know how to plant and conduct experiments properly, layout experiments accurately, manage the experiments properly, record relevant primary data carefully, and generate the required secondary data for deriving valid conclusions. Though a lot of books are available on statistics and statistical analysis of the data from experiments, very scattered material is available on experimental techniques and on how to conduct experiments and record data in the form of methods and materials of research papers in journals. Refined know how on layout and management of the experiments and proper methodology for recording data is lacking in the universities and agricultural research systems in underdeveloped and developing countries.

For development of agriculture and increasing agricultural productivity, improved technology must be developed, disseminated and adopted by farmers for the development of agriculture. Improved crop production technology is more likely to be adopted by farmers, if it is relevant to the farmers needs, provides solutions to the problems of the farmers, fits well into the farming systems followed by farmers, and/or it increases yield and income. On-farm research is planned and on-farm experiments (OFE) are conducted to find out which elements of the improved technology are most appropriate for the farm conditions of representative farmers. Designs for on-farm trials are some what different than station trials and so is their analysis. Proper planning, designing, and conduct of OFE are important for agriculture development. There is great scope to improve the on-farm research and on-farm experiments/trials. Demonstration of new improved technology in comparison with farmers own practices, is important for adoption. Thus it is relevant to discuss demonstration methodology

Following collection of data, the next important step is to statistically analyze the data to extract required information and draw suitable conclusions. Though computers and statistical packages are available these days, very few researchers and teachers have the required know how to analyze the data in an appropriate manner. There is a greater need to know what is the proper procedure for statistical analysis of the data, what is the most appropriate procedure for comparing treatments means and what model to fit in case of trend analysis. The survey of published research papers and reports show that the ANOVA could have been improved and more appropriate procedure for the comparison of treatments means could have been used to achieve the objectives for which the experiments have been designed, if the researchers had proper training in proper statistical procedures for analysis of the data, for appropriate comparison of treatments means and for extracting possible useful information.

The aims of research in plant sciences are to generate new knowledge. The knowledge generated from research must be presented in an appropriate way. Proper presentation and interpretation of the analyzed data and results is important for communication of the findings of research to fellow scientists and to the end user of agricultural research, the farmers. A quick survey of the results presented in the research publications and reports reveals that there is plenty of scope to improve the presentation of data, interpretation of results, deriving conclusions and formulating recommendations. Thus training in presentation and interpretation of results from experiments on crops is also needed for proper style and format of publications so that the benefits of research findings reach fellow scientists, extension workers, funding agencies and farmers in appropriate form and style. This part of the training is needed to improve the quality of

communication of knowledge among scientists. It will also be useful for formulating better messages for the research clientele, the farmers.

#### **IV. PURPOSE:**

Though the training will mainly focus on research and experimentation in plant sciences, this training workshop is designed to help the participants in learning research principles that are equally applicable to all disciplines of agriculture in which the scientific method is used for the solution of problems and the pursuit of truth. Statistical techniques will be briefly reviewed from the standpoint of which techniques are more commonly used for various types of situations as this training is not solely for methods of statistical analysis of data from research projects.

#### **V. TRAINING COURSE OBJECTIVES:**

The training will approach research and research methodology from a broad perspective. This training is designed to help participants learn principles that will help them throughout their lives. The principles of research methodology allow thoughtful analysis of general situations for pursuit of new knowledge through basic research and deeper insight and analysis of problems for possible applied research to seek solutions to problems impeding agriculture development. More specific objectives are to:

- A. Learn the fundamentals of research and how to apply them for preparation of a research proposal and for conducting research. The research proposals are needed to obtain funds for research. The research must be conducted in an appropriate way to justify the provision of funds. The participants will learn:
  - i. The planning of research and design of experiments
  - ii. The techniques of how to conduct field and lab experiments
  - iii. The basics of on-farm trails and demonstration plots
  - iv. The basics of appropriate statistical analysis
  - v. Proper way to interpret results, draw valid conclusion and formulate appropriate recommendations
- B. Become familiar with research methodologies for on-campus, on-station, and on-farm research. The participants will be able to apply methodology to their particular fields of academic interest.
- C. Integrate principles of research methodology learned in the training with knowledge in their field of study to critically evaluate research proposals and research publications and to gain experience in reading and interpreting research findings and reports.

## **VI. SCOPE AND IMPORTANCE OF THE TRAINING**

There is a great scope to develop agriculture through strengthening the institutional capacity of the agricultural education and research organizations for better teaching, more efficient student training and more productive research. For productive and useful research and increasing the chances of getting reliable results, there is an urgent need to train researchers in proper research methodology including proper designing and conduct of on-station experiments, on-farm trails and demonstration plots. There is also a great need to train teachers and researchers in appropriate methods for statistical analysis of data from experiments and in the correct interpretation of results from basic and applied research projects.

This type of training will improve the usefulness of the information and knowledge generated from agriculture research. Through the training, the teachers and researchers will learn how to write research proposals, how to properly design experiments, how to conduct research and experiments in appropriate manner and how to analysis data in appropriate manner for drawing valid conclusions for the benefit of the farming community. The improved research capability of the teachers and researchers as a result of the training workshop will enrich their experience and improve their working which will enhance agricultural productivity with benefits accruing to farmers and the general public in the form of food security, poverty alleviation, and ameliorating standards of living which will pave the way for peace and prosperity.

## **VII. TRAINING SCHEDULE FOR THE WORKSHOP**

A total of about 34 training sessions have been planned; [5 (first day) + 4x6 (intervening days) + 5 (last day)]. A tentative list of titles for the training sessions is given in Annexure-I. There will be 5 training sessions on first day because of the registration and inauguration and 5 lectures on the last day, because of the concluding ceremony and certificates distribution. On day two to day fifth, there will be 6 training sessions each day. Tentative training schedule for the workshop is given in Annexure-II.

## **XVI. ASSESSMENT OF THE TRAINING**

In order to find out the success of the training, the participants will be asked to assess the training at the end of the training workshop through a training evaluation sheet. Suggestions will be asked to improve the workshops in the future. Suggestions will also be asked for future training needs.

## Annexure - I

### List of Titles for Training Sessions

#### Introduction to research methodology

- 1 Introduction -- Science, Research and Experimentation
  - 2 Designing experiments and steps involved in proper designing of experiments
  - 3 Decision about factor(s) and treatments to be studied
  - 4 Experimental design – its objectives and principles
  - 5 Basic experimental designs, CRD, RCBD, LSqD
  - 6 Split-plot, Split-split-plot and Strip-plot or Split-block arrangements
  - 7 Introduction to incomplete block and other designs
  - 8 Number of replications and philosophy of unequal replications
  - 9 Specifying appropriate procedure for comparing means – LSD, LSI, pre-planned comparisons or meaningful contrasts and trend analysis
  - 10 Types of experiments and introduction to conducting crop experiments
  - 11 Writing detailed procedure for conducting experiments
  - 12 Preparation of experimental units, seed and other material for planting experiments and subsequent application to experimental units\*
  - 13 Field layout of experiments; plot size adjustment to accommodate experiments in fields, orientation of plots and replications \***
  - 14 Planting field and green house experiments \***
  - 15 Application of treatments, inputs and management of experiment\***
  - 16 Recording data, plot sampling and sample size. Field note book and experimental register. \***
  - 17 Spreadsheet program for compilation, management, and generation of data
  - 18 On-farm Research --- A Review
  - 19 On-farm experimentation --- Introduction and some basic designs
  - 20 Demonstration plots methodology
  - 21 Introduction to statistical analysis, analysis of variance, tests of significance
  - 22 Analysis of data from simple two-treatments experiment
  - 23 Analysis of data from CRD and randomized complete block design
  - 24 Analysis of data from Latin square design
  - 25 Analysis of data from factorial experiments
  - 26 Analysis of data from factorial experiments with split-plot arrangement
  - 27 Use of LSD and LSI for comparing means
  - 28 Use of pre-planned comparisons or meaningful contrasts
  - 29 Trend analysis, linear regression, curve fitting, splines and plateau and preparation of graphs
  - 30 Introduction to economic analysis of the experimental data
  - 31 Presentation of results in tables and graphs
  - 32 Interpretation of results --- single factor experiments
  - 33 Interpretation of results --- two factors experiment
  - 34 Exercise and presentation by groups with suggestions for improvement**
  - 35 Exercise and presentation by groups with suggestions for improvement**
- \* Depending upon weather, field facilities, and other factors, the training sessions in green will be held in field if possible.**

## ANNEXURE -II

### Tentative schedule for the workshop: Typical programs for the first day, the intervening days and the last day

Program for the first day

| Time      | Training session  |
|-----------|---|
| 0800-0900 | Informal get together, registration, and inauguration   |
| 0900-1000 | Training session - 1  |
| 1000-1015 | Coffee/Tea Break and informal discussion  |
| 1015-1115 | Training session - 2  |
| 1115-1215 | Training session - 3  |
| 1215-1315 | Training session - 4  |
| 1315-1400 | Prayer and lunch break  |
| 1400-1500 | Training session - 5  |
| 1500-1600 | Discussion including suggestions. Making of groups.<br>Discussion about exercises and presentations by groups |



Program for the intervening days (day 2 on wards)

| Time      | Training session  |
|-----------|---|
| 0800-0830 | Review of the previous day sessions and exercises by groups |
| 0830-0930 | First training session of the day                           |
| 0930-1030 | Second training session of the day                          |
| 1030-1045 | Coffee/Tea Break and informal discussion                    |
| 1045-1145 | Third training session of the day                           |
| 1145-1245 | Fourth training session of the day                          |
| 1245-1345 | Fifth training session of the day                           |
| 1345-1430 | Prayer and lunch break                                      |
| 1430-1530 | Sixth training session of the day                           |
| 1530-1600 | Discussion and work on exercises by groups                  |

Program for the last day

| Time      | Training session  |
|-----------|---|
| 0800-0830 | Review of the previous day sessions and exercise by groups    |
| 0830-0930 | Training session - 30   |
| 0930-1030 | Training session - 31   |
| 1030-1045 | Coffee/Tea Break and informal discussion                      |
| 1045-1145 | Training session - 32   |
| 1145-1245 | Training session - 33   |
| 1245-1345 | Training session - 34   |
| 1345-1430 | Prayer and lunch break  |
| 1430-1530 | Certificate distribution                                      |
| 1530-1600 | Discussion – Evaluation and further training needs assessment |