

Training Course Technical Report

Statistical Design, Data analysis and Biometrical Techniques in Agricultural Research

3/ 10/ 2016 - 13/ 10/ 2016
Amman, Jordan



Funded By

Japan International Cooperation Agency (JICA)
Arab Fund for Economic and Social Development (AFESD)

Conducted By

The International Center for Agriculture Research in the Dry Area (ICARDA)



Table of Contents

EXECUTIVE SUMMARY	1
GENERAL OVERVIEW.....	2
OBJECTIVES	2
TARGET AUDIENCE.....	2
ORGANIZING COMMITTEE	2
COURSE STRUCTURE.....	2
COURSE IMPLEMENTATION	3
GENERAL COURSE EVALUATION BY TRAINEES	4
CONCLUSION	4

EXECUTIVE SUMMARY

Name of the project

Capacity development for agriculture and water management for Iraq and regional Countries

Partners

- Arab Fund for Economic and Social Development; AFESD (<http://www.arabfund.org/>)
- Japan International Cooperation Agency; JICA (<https://www.jica.go.jp/english/>)

Purpose

The purpose of the course was to enhance capacity development of government officials and researchers who are engaged in agricultural development in Iraq and other countries. They gained knowledge and information on application of techniques and tools generate, manage and analyze data in the research environments of water resources management, crop improvement and crop management.

Specific objectives of the training course

To share knowledge on statistical concepts and methodologies for designing and analyzing data from field experiments, biometrical techniques applied in agricultural research, use of Genstat software, and to provide an opportunity to active researchers to carry out statistical analysis of their data, and prepare a draft research manuscript for publication and discuss experimental designs for the forthcoming seasons.

Specific outputs

Seventeen (9 male, 8 female) professionally trained NARS partners from Iraq and other countries were trained on experimental designs, enhanced data management, statistical analysis and some biometrical techniques in agricultural research. While ten Iraqis, one Algerian, and two Jordanian are funded by JICA, the others were sponsored by AFESD. They were provided with training material on the individual topics discussed and demonstrations shown in the area of statistics design, data analysis and biometrical techniques in agricultural research. Eight participants had brought data from their experiments and analyzed them with comments on the interpretation of results, while one participant generated randomized plan for his planned experiment for the next season. Participants' feedback was that they learnt a great deal and also expressed that such a course should be repeated in future with a much longer duration.

GENERAL OVERVIEW

For enhancing capacity of NARS of the WANA region for science quality in the research areas of Iraqi Ministry of Water Resources, ICARDA formulated the training course entitled “Statistical Design, Data Analysis and Biometrical Techniques in Agricultural Research” for designing and analysis water management experiments with financial support of AFESD and JICA. A total of 17 participants were invited to share knowledge on basics of generation and statistical analyses of data from designed experiments in the areas of water resources and crop improvements. The course was successfully implemented as planned.

OBJECTIVES

To share knowledge on statistical concepts and methodologies for designing and analysing field experiments, biometrical techniques applied in agricultural research, use of Genstat software and to provide an opportunity to active researchers to carry out statistical analysis of their data.

TARGET AUDIENCE

The course is set to target 17 mid-level researchers working in water resource management, crop improvement in the West Asia and North Africa region represented by participants from Iraq (10), Jordan (2), Lebanon (1), Algeria (1), Tunisia (2), and Sudan (1) (Please refer to Annex III).

ORGANIZING COMMITTEE

Dr. Murari Singh, ICARDA Senior Biometrician

Mr. Charles Kleineremann, Head, ICARDA Capacity Development Unit (CDU)

Mr. Khaled El-Shamaa, ICARDA Research Database Manager and Senior Analyst

Mr. Masafumi Tamura, Technical Training Officer, ICARDA CDU

COURSE STRUCTURE

The course covered:

- Data management: Spreadsheet (Excel), Import and Export to other data formats, Data validation using pivot table, statistical functions and data transformation; use of Data Analysis Tools add-in.
- Estimation and testing hypotheses on means and variances; correlation and regression
- Design and analysis of variety trials: designs in randomized complete blocks (RCB) and incomplete blocks (alpha designs), combined analysis of data from several environments to evaluate GxE interaction
- Design and analysis of agronomic field trials: Multi-factor experiments in RCB, split-plot experiments in RCB, strip-plot experiments in RCB
- Introduction to Genstat for Windows and its use for management of data
- ICARDA’s Online Biocomputing facility
- Identification of statistical approaches for analysis of participant’s data, analysis and interpretation of the results

COURSE IMPLEMENTATION

The training lectures and demonstrations on the practical were delivered to the participants. They practiced the advanced features of Excel for data management, completed exercises on generation of randomized plans, and analysis of datasets provided to them. Trainees presented the experiment descriptions and the data brought for analysis, followed by the comments and approach for the analysis mentioned by the instructors. The training course was run from 9am – 4pm each working day during 3 – 13 October 2016. The training was imparted by two technical instructors from ICARDA: Dr. Murari Singh, Senior Biometrician and Mr. Khaled El-Shamaa, Research Database Manager and Senior Analyst (Please refer to Annex II). The course implementation and program is summarized in the course agenda (please refer to Annex I).

The course was inaugurated with an opening speeches by Mr. Junji Wakui, Senior Representative, JICA Jordan Office, Dr. Murari Singh, Senior Biometrician, ICARDA and Mr. Charles Kleinermann, Head-CDU, ICARDA.



The course started with a presentation from Dr. Singh describing the course and course schedule and expected feedback on how to proceed for the case studies for statistical analysis. It was followed by Mr. Shamaa to introduce the data management using Excel and explain statistical functions, transformations, filter, text to columns, data validation, basic statistics and pivot table.

On the second day, Dr. Singh gave a lecture on estimation and test of hypothesis on means and variances, while Mr. Shamaa added different aspects of Excel data management followed by a practical session to understand the use of the Excel analysis ToolPak add-in.



On the third day, Dr. Singh delivered a lecture on correlation and regression analysis while Mr. Shamaa continued to work on a practical session on Excel scatter plots, and trend line options.

On the fourth day, Dr. Singh introduced GenStat and gave a practical session of generation of RCBDs using GenStat for analyzing data from an RCBD.

On the fifth day, Dr. Singh and Mr. Shamaa facilitated case studies by participants, and the following gives the short titles of the analysis carried out by the participants on their own data:

Tunisia: Analyses of wheat and chickpea germinations in petri-dishes in CRD

Algeria: Analysis of data on barley genotypes evaluated in alpha designs

Iraq: Analysis of data for fertilizer effect on wheat

Iraq: Soil Salinity status summary

Iraq: Comparing fertilizer types and their levels in RCBD

Iraq: Experimental design for fertilizer trials in split-strip plot experiment with tillage, irrigation and organic matter

Lebanon: Forage types and plant density effect on palatability, body weight and milk production

Jordan: Chickpea (25), faba bean and lentil (36) genotypes evaluation in alpha designs

Jordan: Feeding trial with barley - vetch mixture and stage of cutting on dry weight, fibre, and protein (design RCBD, 2 locations)



After presentation of the case studies, Mr. Shamaa introduced ICARDA's online bio-computing service followed by both lectures' consultation for analysis ICARDA online bio-computing service.

On the seventh day, Dr. Singh introduced two factor factorial experiments and it was followed by its practical session on design and analysis of two factor factorial trials in RCB.

On the eighth day, Dr. Singh and Mr. Shamaa shared additional information on ICARDA online bio-computing service and its country case studies.

The last day of the training started with clarification of country case studies, general comments, and queries, and was followed by a certificate award ceremony, and feedback from trainees and suggestions on how to improve the courses. The certificates were distributed with speeches by Ms. Suha Bakir, JICA Jordan office, a representative of the participants, Dr. Murari Singh, and Mr. Masafumi Tamura, ICARDA.



GENERAL COURSE EVALUATION BY TRAINEES

At the end of the training, each participant provided feedback on their perception of the effectiveness of the training process, format and content. This gives ICARDA valuable information from which to validate or fine-tune each training component as well as the overall training program. Through training evaluation questionnaires, this report presents an overview of the final evaluation (Annex IV). Regarding the overall methodology of the training course, most participants qualified it as Excellent or very good, and the average score of each item range from 4.2 to 4.7 pts/5.0 pts which also express participants' satisfaction. Participants expressed their interest in giving more time for field work and practical session (Please refer to Annex IV).

CONCLUSION

The training course was successfully implemented as planned. The participants learned the techniques and tools on design of experiments, data management, and statistical analysis and with application in

crop improvement and resources management. They also practiced use of advanced Excel, Genstat statistical software and ICARDA online Biocomputing facility. The feedback from participants was that such a course should be out-scaled with a longer duration.