



## Technical Report

### **TRAINING COURSE ON**

Soil Analysis - Soil Chemistry, Soil Physics and Soil Fertility

February 21-25, 2016

Amman, Jordan

**Japan International Cooperation Agency (JICA)  
and**

**International Center for Agricultural Research in the Dry Areas (ICARDA)**



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## EXECUTIVE SUMMARY

### **Name of the project**

Capacity Development for Agriculture for Afghanistan and Regional countries

### **Partners**

Japan International Cooperation Agency (JICA)

International Center for Agricultural Research in the Dry Areas (ICARDA)

National Center for Agricultural Research and extension (NCARE) - Hashemite Kingdom of Jordan

### **Purpose**

To enhance capacity development of government officials and researchers who are engaged in agricultural development in Afghanistan and other countries

### **Specific objectives of the training course on Salinity Management**

Up-to-date knowledge and enhanced capacity in soil analysis, soil chemistry, soil physics, and soil fertility

### **Specific outputs**

Twenty professionally-trained national agricultural research trainees: 9 from Afghanistan, 2 from Jordan and 7 from a range of other countries (2 from Sudan, 1 from Iraq, 2 from Palestine, and 2 from Egypt) on Improving soil analysis techniques in agricultural systems with emphasis on dry land agriculture. While 10 Afghanis, 2 Jordanian, 1 Sudanese and 1 Egyptian were funded by JICA, the remaining participants were sponsored by Arab Fund for Economic and Social Development (AFESD).

### **Specific outcomes**

Design, implement, manage, analyze and report on research and development in soil management and acquire up-to-date information on research and practical activities in soil management in each participating country.



## **GENERAL OVERVIEW**

Water is the major limiting factor of agricultural production in the dry areas of the Central and West Asia and North Africa (CWANA) regions. Despite the fact that agriculture accounts for around 80-90% of freshwater usage in this region, the rapidly growing population, industrialization, and urbanization has led to the reallocation of water from agriculture to other sectors. At the same time, high population growth rates require a continuous increase in agricultural production.

## **CONTEXT**

This training course provided an overview on soil and water analysis and its practice in the laboratory. Knowing the quality and characteristics of soil and water allows for increases in agricultural productivity and profitability. The application of water and fertilizers is closely tied to the soil characteristics. For example, planners cannot formulate recommendations for farmers if they are not able to interpret the soil characteristics, and the same is applied for water – if you do not know the characteristics of water being used for application to crops, you cannot manage potential sub-optimalities that may emerge.

## **PURPOSE**

The focus of the course was predominantly on soil analysis including soil chemistry, soil physics and soil fertility. The purpose of the course was to provide participants with the necessary practical and theoretical information to analyze soil and water samples from agricultural landscapes. At the end of the course, the participants were expected to be able to:

- Take samples of soil and water as per scientific methodology
- Prepare samples for lab analysis
- Understand the methodology to use and the equipment to select for analysis
- Analyze samples and interpret results

## **TARGETED AUDIENCE**

The target audience for this course were mid-career scientific staff of national partner institutions who are educated in soil and water management/analysis. Trainees were from the following countries: 11 trainees from Afghanistan and 9 from other countries that included Sudan, Iraq, Palestine, Jordan and Egypt. While 10 Afghans, 2 Jordanians, 1 Sudanese and 1 Egyptian are funded by JICA; the remaining trainees were sponsored by AFESD. The trainees were expected to return to their parent institutions to share the knowledge gained in the course with their peers. In addition, they are expected to apply the knowledge they gained through the course in carrying out their job-related analysis tasks. Please refer to Annex III for the detailed list of trainees.

## ORGANIZING COMMITTEE

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

Dr. Vinay Nangia, ICARDA, IWLMP, Course Coordinator Eng. Luma Abu Atileh, IWLM, ICARDA

## COURSE STRUCTURE

With the financial support from JICA, through its overseas office in Afghanistan and in collaboration with NCARE and AFESD, ICARDA conducted the course at ICARDA's offices in Amman, Jordan. The course included classroom lectures and discussions, as well as practical field and laboratory exercises. The lectures were given in English, and all course material was provided as hardcopies as well as softcopies in the form of individual flash drives to the trainees. A certificate of attendance was awarded at the end of the course to each trainee.



## COURSE IMPLEMENTATION

The course started with an introduction to soil science including soil formation, soil horizons, soil-water-plant relationships, and was followed by lectures on principles and methods of analysis of soil physical properties, chemical properties and fertility topics. On Tuesday, the trainees received a lecture on how to take soil samples, apply tools to use, and performed field exercises to practice soil sampling followed by the visit to NCARE for hands-on experience and knowledge on laboratory work on soil physical analysis. On Wednesday, the trainees visited ICARDA's soil and water analysis laboratory in Mushaggar Research Station near Amman where they were given information and training on soil chemical analysis.

Overall, the trainees were given theoretical as well as practical knowledge on how to handle, analyze and interpret soil and water samples from agricultural landscapes. Student's interaction and participation during the course was very positive. Questions were politely raised in due time and using clear English. Spontaneous interruptions were conceded from time to time by the teachers to allow for quick reciprocal consultations among the students, which ensured better knowledge exchange and better understanding of the lecture topics. Positive and constructive behavior was particularly shown during the field trips. For the detailed course program, please refer to Annex I.

## GENERAL COURSE EVALUATION BY TRAINEES

During the training the students generally manifested appreciation for the course as a whole and for the trainers. That was made evident by their positive level of interaction, and by their scientific interest. It was clear that some of the students (technicians in particular) were more interested in the technical and practical parts of the course, while others (researchers) had more balanced interests. The general impression, however, was that most of them appreciated having an opportunity to refresh a wide range of basic knowledge that they acquired during they studies without being presented with opportunities for successive update.

The quantitative evaluation expressed by the students through the evaluation forms reflect this positive impression. The relevance of the course was rated very high (4.7/5.0), along with the usefulness of the lectures (4.7/5.0) and the effectiveness of teaching in general (4.8/5.0), and the quality of teaching material (4.7/5.0). Most of the other indicators are also high and span between 4.1 and 4.5 out of max 5.0. The only relatively low scores refer to the time allocated to discussions (3.5/5.0), suggesting the high level of interest raised by the topics presented. For more information on the evaluations, please refer to Annex IV.



## CONCLUSION

The course was successfully executed as planned, and most trainees requested that the course duration should be 2 – 3 weeks instead of one week in order to be able to include topics such as land evaluation, reclamation of soil problem, soil chemical analysis, microbiological analysis, fertilization, and water irrigation methods.

Based on trainee recommendations to extend the period of training, ICARDA may develop for the next JICA co-funded training program contract opportunities to the most qualified trainees who attended the course.





## Annex I: Course Program

Date	Topic	Responsibility
<b>Sunday Feb 21</b>		
08:30 – 09:00	Registration	IWLMP-CDU
09:00 – 10:00	Opening session, and course presentation by L. Ibrahim	ICARDA and JICA
10:00 – 10:30	Coffee break and group photo	
10:30 – 12:30	Introduction to soil formation and soil horizons	C. Zucca
12:30 – 13:30	Lunch	
13:30 – 15:30	Soil-water-plant relationship	S. Strohmeier
<b>Monday Feb 22</b>		
09:00 – 11:00	Principles and methods of physical properties analysis	S. Strohmeier
11:00 – 11:30	Coffee break	
11:30 – 12:30	Soil chemical properties	C. Zucca
12:30 – 13:30	Soil fertility	C. Zucca
13:30 – 14:30	Lunch	
14:30 – 16:00	Principles and methods chemical properties analysis	L. Ibrahim
<b>Tuesday Feb 23</b>		
09:00 – 10:00	Soil description and sampling lecture	C. Zucca
10:00 – 13:00	Soil description and sampling (in the field)	C. Zucca
13:00 – 14:00	Lunch	
14:00 – 16:00	Soil physical measures in the field (Mushaggar Station)	S. Strohmeier and C. Zucca
<b>Wednesday Feb 24</b>		
09:00 – 09:30	Travel to Baq'aa Research Station	
09:30 – 11:00	Laboratory work on soil physical analysis	L. Ibrahim
11:00 – 11:30	Coffee break	
11:30 – 13:30	Laboratory work on soil physical analysis	L. Ibrahim
13:30 – 16:00	Lunch and return to Amman	
<b>Thursday Feb 25</b>		
09:00 – 09:30	Travel to Mushaggar Research Station	
09:30 – 11:00	Lab work on soil chemical analysis	L. Ibrahim
11:00 – 11:30	Coffee break	
11:30 – 13:30	Lab work on soil chemical analysis	L. Ibrahim
13:30 – 15:00	Lunch and return to Amman	
15:00 – 16:00	Award of certificates and closing session	ICARDA and JICA

## Annex II: Trainers



**Dr. Claudio Zucca** is Soil Conservation and Land Management specialist within the Integrated Water and Land Management (IWLM) Program of ICARDA, in Amman, Jordan. Dr. Zucca has a Ph.D. in Pedology. Before joining ICARDA he was employed as a senior researcher at the University of Sassari (Italy), where he worked at the Department of Agricultural Sciences and at the Desertification Research Centre (NRD). His studies mainly addressed land degradation, particularly soil erosion, and land evaluation, and were characterized by interdisciplinary approaches integrating fieldwork and geomatics. His most recent research was focused on

evaluating the impacts of land restoration and soil conservation practices on the provision of ecosystem goods and services. Additionally, as a consequence of his strong interest in soil genesis and geography, he performed basic pedologic research and took part to several soil survey and mapping studies. He has 28 ISI publications.



**Ms. Luma Ibrahim** holds B.Sc. degree in chemical engineering from Jordan University (2003). Her work experience includes position of soil and water laboratory supervisor at ICARDA since April, 2014, quality assurance and supervisor of fertilizer analysis laboratory at Al Mada for Chemical Industries Co. and as quality officer and lab supervisor at National Center for Agricultural Research and Extension of Jordan.



**Dr. Stefan Strohmeier** is Post-doctoral Soil and Water Conservation scientist within the Integrated Water and Land Management (IWLM) program at ICARDA in Amman. He earned his M.Sc. in Environmental Engineering and Water Management at BOKU University in Vienna, Austria, in 2009, and his Ph.D., in Environmental Engineering, also at BOKU University Vienna in 2014. Moreover, he has an engineering grade (Ing.) in Civil Engineering gained from Higher Technical School in Villach, Austria. He worked at a Geo-Technics company in Vienna from 2009 to 2010, and as a Research Assistant at BOKU University from 2010 to 2014. During this time, he lectured on various courses related to the Institute of Hydraulics and Rural Water Management at BOKU University, and



moreover, he co-supervised multiple Master students of the Environmental Engineering and Water Management program. His main research focus is on agricultural hydrology, land degradation and soil erosion issues on experimental basis as well as using hill slope and watershed scale hydraulic/hydrologic models. He published different papers in international ISI journals focusing on surface hydrology and soil and water conservation.



**Dr. Vinay Nangia** is a Senior Agricultural Hydrologist at ICARDA, special associate professor at International Platform for Dryland Research & Education of Tottori University of Japan (cross appointment between ICARDA and Tottori Univ.) and an adjunct faculty at the Texas A&M University (USA). He received his Ph.D. in Water Resources Science and two M.S. degrees - one in Biosystems & Agricultural Engineering and another in Geographic Information Science - all from the University of Minnesota, USA. Throughout his career, he has applied skills in hydrologic and crop modeling, and GIS and remote sensing to research issues relating to climate change,

climatic variability, conservation agriculture, water quality, water productivity, land degradation and sustainable crop production. During a 10-year research career, he has served as a PI or co-PI on research projects worth about \$5.75 million, authored or co-authored 59 technical publications that include 27 refereed journal articles in national or international journals. Dr. Nangia is an internationally-recognized authority in hydrologic and water quality modeling and GIS applications in water resources management. He has conducted more than 20 training activities (covering a total of 400 participants) on hydrologic modeling in 10 countries. Dr. Nangia serves on the editorial board of professional society journals. He has served as research advisor/committee member to M.S. and Ph.D. students and was a visiting assistant professor (2007-2011) at the Institute of Soil and Water Conservation of the Chinese Academy of Science where he co-advised graduate students. Previously, Dr Nangia was a NSERC Visiting Fellow at Agriculture and Agri-Food Canada conducting research on GHG emissions from sub-surface tile-drained croplands of Eastern Ontario prior to which he was a post-doctoral fellow at the International Water Management Institute (IWMI), where he started his career in 2005.

### Annex III: Trainees List of Contacts

Name/Country	Position/Specialization/Institution	Contact
Mr. ABDUL WARES NIZAM / Afghanistan	Soil classification employee / pedologist/ Research section of Nangrahar's Agriculture Irrigation and livestock department	Mobil: 0093(0) 700483746
		E-mail: <a href="mailto:abdulawares_nizam@yahoo.com">abdulawares_nizam@yahoo.com</a>
Ms. NOORMA SADAT / Afghanistan	Soil Biological Analyst / Soil science /Soil Research Directorate MAIL	Mobil: +93(0) 799 839 014
		E-mail: <a href="mailto:noormas444@yahoo.com">noormas444@yahoo.com</a>
Mr. ABDUL SEDIQ NAZARI / Afghanistan	Head of soil analysis laboratory /Agronomy/ balkh DAIL	Mobil: +93(0)700 529 415
		E-mail: <a href="mailto:nsediq@yahoo.com">nsediq@yahoo.com</a>
Mr. KH. MOHD NESAR NESAR / Afghanistan	Specialist of technical soil sampling/ Agronomy /Soil research directorate MAIL	Mobil: +93(0) 772 377 738
		E-mail:
Mr. BISMILLAH SOFIZADA / Afghanistan	Expert of Soil and fertilizers analysis /Agronomy/ Soil research directorat MAIL	Mobil: +93(0)700 278 894
		E-mail: <a href="mailto:bismillahsofezada@gmail.com">bismillahsofezada@gmail.com</a>
Mr. SADULLAH HAZRATY / Afghanistan	Expert of soil improvement / Agronomy /Soile research directorat MAIL	Mobil: +93(0) 707 369 460
		E-mail: <a href="mailto:sadullah_95@yahoo.com">sadullah_95@yahoo.com</a>
Mr. SAYED AZMAR SADAT / Afghanistan	Soil classification employee / pedologist/ Research section of Nangrahar's Agriculture Irrigation and livestock department.	Mobil: +93(0)700603601
		E-mail: <a href="mailto:sayed_azmar@yahoo.com">sayed_azmar@yahoo.com</a>
Mr. MOHD MOHSIN BURHAN / Afghanistan	Head of soil fertility and soil improvement / soil expert /Agriculture Research Institute of Afghanistan ARIA	Mobil: +93(0) 799 304 689
		E-mail: <a href="mailto:mohsin.burhan@yahoo.com">mohsin.burhan@yahoo.com</a>
Mr. KH. NASRATULLAH SEDIQI / Afghanistan	Specialist of Soil, plant and fertilizers Analyst / Natrual resource mangment / Soil research directorat MAIL	Mobil: +93(0)707797223
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		E-mail: <a href="mailto:sharifi.icarda2015@gmail.com">sharifi.icarda2015@gmail.com</a>
Mr. Mahmoud Ahmed Hussein / Egypt	Ministry of Agriculture –ARC- Assistant Researcher in Soil , Water and Environment Institute (SWERI) department of fertility of soil	Mobil: 00201147075873
		E-mail: <a href="mailto:pepo_2040@yahoo.com">pepo_2040@yahoo.com</a>
Ms. Maraheb Ibrahim Habeb Alla Mohamed El Faki / Sudan	College of agricultural –department of Soil and water science/job in ARC in sudan –Soba research for reclamation of saline sodic station./ Khartoum – Sudan.	Mobil: +249923181787
		E-mail: <a href="mailto:marahbebrahim@yahoo.com">marahbebrahim@yahoo.com</a>
Ms. Elham Younes Abu-Rumman / Jordan	Laboratory Department, NCARE	Mobil: 0777601015
		E-mail: <a href="mailto:fertrun@yahoo.com">fertrun@yahoo.com</a>
Ms. Sana'a Mousa Abu-Orabi / Jordan	Analyst in soil laboratory	Mobil: 0785080097
		E-mail: <a href="mailto:faiezhyasat@gmail.com">faiezhyasat@gmail.com</a>

## Annex IV: General Course Evaluation

### I. Contents of the course:

	OVERALL AVERAGE
<b>Relevance of the subject to your job</b> 1=Not relevant; 5=Very relevant	4.7
<b>Acomplishment of subject matter</b> 1=Not clear; 5=Very clear	4.5
<b>Clarity of course objectives</b> 1=Not clear; 5=Very clear	4.4
<b>Level of lectures</b> 1=Too basic; 5=Too advanced	4.2
<b>Time allocated for discussions</b> 1=Too short; 5=Too long	3.5
<b>Interaction with participants enrolled in the course</b> 1=Very low; 5=Very high	4.4
<b>Overall, how would you rate this course</b> 1=Poor; 5=Excellent	4.5

### II. Teaching aids:

	OVERALL AVERAGE
<b>Percentage of Time allocated to lectures</b> 1=Not effective; 5=Very effective	4.1
<b>Usefulness of Lectures</b> 1=Not clear; 5=Very clear	4.7

### III. Teaching aids:

	OVERALL AVERAGE
<b>Effectiveness of teaching aids in general</b> 1=Not effective; 5=Very effective	4.8
<b>Clarity of slides/overheads</b> 1=Not clear; 5=Very clear	4.7
<b>Handouts</b> 1=Not useful; 5=Very useful	4.7

### IV. Logistics:

	OVERALL AVERAGE
<b>Pre-course communication</b>	4.8
<b>Travel arrangements</b>	4.4
<b>Quality of the accommodation</b>	4.5



<b>Payment of allowance on time</b>	4.2
<b>Transportation services</b>	4.6
<b>Lecture rooms</b>	4.4

**V. General comments and suggestions on the course:**

1. Please state the three most important ideas/concepts that you learned from this course
  - Soil sampling, and importance of soil chemical analysis and physical analysis
  - Analysis with organic matter in the laboratory
  - Soil texture, structure, soil quality, description of soil profile for land evaluation and classification
2. Suggestions for future improvement of the course
  - Need more time 2-3 weeks for land evaluation and reclamation of soil problem
  - Need more time for soil chemical analysis, microbiological analysis, fertilization, and water irrigation methods
3. Do you recommend this course to be repeated in the future?

Yes 100% No 0%