



**Technical Report**

**TRAINING COURSE ON**

***SALINITY MANAGEMENT***

**2 – 6 November, 2014**

**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 and Water management for Iraq 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 irrigation projects and agricultural development mainly in Iraq

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

Up-to-date knowledge and enhanced capacity in the design, implementation, management, analysis and reporting of agricultural research related to salinity management

### **Specific outputs**

9 professionally-trained NARS partners from Iraq, 2 from Jordan and 2 from other countries: 1 from Tunisia and 1 from Lebanon on Improving Water Productivity in Agricultural Systems with emphasis on dry land agriculture

### **Specific outcomes**

- Design, implement, manage, analyze and report on research and development in the area of water productivity in dry land agriculture and acquire up-to-date information on research and practical activities in the management of water resources in each participating country.
- Apply an Integrated Natural Resource Management approach to optimize the use of scarce water resources.



## GENERAL OVERVIEW

Water is the major limiting factor for agricultural production in the dry areas of Central and West Asia and North Africa (CWANA). Agriculture accounts for around 80% of water consumption in the region, however, the rapidly growing population, industrialization, and urbanization will lead to reallocation of water increasingly away from agriculture to other sectors. On the other hand, high population growth rates require a continuous increase in agricultural production.

Salinity management in agriculture is interpreted differently by different entities. This often creates misunderstandings about approaches towards managing salinity (or effects of salinity) in agriculture.

Most of the salinity affected areas in Iraq and Egypt are related to irrigation water management. Irrigation water management can either be the cause, and/or the solution to salinity management in agriculture. In countries like Jordan and Palestine, solutions to reduce salinity in saline areas are highly limited, or not economically feasible. Therefore we approach salinity management in terms of "fighting salinity" for areas where water management is a possible tool, and "living with salinity" where we are adjusting our agronomic practices to maximize agricultural production under saline conditions. Note that one approach does not exclude the other, and that in areas of the Mesopotamian plain, as well as in the Nile Delta, a mixture of solutions from the "fighting salinity" and "living with salinity" is needed.

ICARDA's mission is to improve the welfare of people through agricultural research and training to increase the production, productivity, and quality of food, while preserving or improving the resource base. ICARDA's training courses are designed to improve the capabilities of scientists and technicians in national agricultural research systems (NARS) in developing countries to conduct research independently, and to foster transfer of technology and address issues related to farmers' decisions in adopting or rejecting new technologies. To this end, ICARDA has organized this course.

## PURPOSE

The course conducted by ICARDA focused on the different approaches towards salinity management, the different conditions that guide us towards solutions, and the interpretation of solutions on long-term sustainability of agricultural production under saline conditions.

The course was developed to introduce the framework, understand the impact of the "solutions" selected for salinity management, and explain the different scales of salinity management (*see details Annex I*).

Several examples from other regions were used to explain the possible advantages and disadvantages of salinity management in the countries of Iraq, Egypt, Jordan and Palestine.



The training is an element in the approach to improve capacity of national governments to understand and implement salinity management frameworks within the capabilities of the country.

### **TARGETED AUDIENCE**

Mid-level career managers of natural resources for agricultural production, involved in field scale, irrigation system scale, and regional scale water, land and salinity management. The focus of the course was on the Mesopotamian plain in Iraq, but the inclusion of representatives from Egypt, Jordan and Palestine allowed for a broader discussion between participants on the possible implementations of solutions.

A total of 16 participants from four countries (Iraq, Jordan, Egypt, and Palestine) took part of the training.

Amongst them 9 trainees from Iraq, 2 from Jordan, 1 from Palestine and 1 from Egypt were supported under JICA Capacity development for agriculture and water management for Iraq and regional countries program ([see details Annex II](#)).

### **COURSE ORGANIZATION**

With financial support from the Japan International Cooperation Agency (JICA), through its overseas office in Jordan and in collaboration with the Jordan's National Center for Agricultural Research and Extension (NCARE), the International Center for Agricultural Research in the Dry Areas (ICARDA) conducted the course at ICARDA-Amman, Jordan.

The course included classroom lectures, discussions and working groups.

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 completion was awarded at the end of the course to each trainee.

### **ORGANIZING COMMITTEE**

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

Dr. Theib Oweis, Director, ICARDA Integrated Water & Land Management Program (IWLMP)

Dr. Richard Soppe, ICARDA Agricultural Salinity Management Specialist, Course Coordinator

### **COURSE STRUCTURE**

The course was setup to maximize the interaction of participants with the course content.

The background of the participants was varied (laboratory analysts, extension service specialists, water engineers, soil engineers, water managers and agricultural researchers) which was an asset in the discussions.



Due to the variety of backgrounds, the focus of the course was on a better understanding and ability to define the problems, and to find solutions through management. Some engineering approaches were used to strengthen the concept of salt mass (and thus the long term sustainability issues).

Lecturing and discussions were for large part conducted by a single person. This was designed to improve the coherency of the course, and to allow a frequent reflection on discussions held earlier in the course.

To allow interaction with other researchers from ICARDA, two additional lecturers were invited to provide additional background on the Australian example, and to provide a detailed example from Central Asia.

## **COURSE IMPLEMENTATION**

The 5-day course was designed to grow into the salinity management framework approach.

The first day included an introduction at the three identified levels of salinity management: field/farm level, irrigation system level, and regional/national level. The two approaches of "living with salinity" and "fighting salinity" were introduced to allow an understanding of the term "salinity management". Salinity management as a mass balance approach was introduced to understand the difference between "managing the accumulation of salts" and "managing the effects of salinizing areas on agricultural production". A broad context presentation was given on the CGIAR research programs "CRP Dryland Systems" and "CRP Water, Land and Ecosystems" to indicate the recent way of thinking about research-for-development contributions towards improving livelihoods and ecosystems under saline conditions.

The second day was used to introduce the concepts of a salinity management framework implementation in Australia at the three management levels introduced on the first day. Based on this example, discussions were held on the potential of these approaches in the countries of Iraq, Egypt, Jordan and Palestine. Sustainability assessments were introduced in the latter part of the day to introduce long-term visions towards proposed solutions, related to sustainability, applicable to the three scales of management.

The third day started with an overview of salt management solutions at field level, using a water and salt flux assessment. Similar to the discussions on the previous day, where mainly the national level approach was discussed, group discussions were held, and examples were given on salinity management options for irrigation districts and field levels. The day concluded with a summary and emphasis on sustainable solution-driven approaches.

The fourth day introduced the problem of salinity management under shallow groundwater conditions. This is a condition that contributes strongly to some of the saline areas in Iraq and Egypt. Examples from research in Central Asia were presented. The second part of the day was used for participants to analyze four case-studies. Four groups were formed to attempt to advice the participants from the other countries on their potential solutions. These solutions



were presented in the course, and discussed on their long-term sustainability, their approach towards management salinity mass or effects of salinity on agricultural production, and methods to implement these solutions.

The last day was used to introduce the assessment and results from a project that focused on salinity management in central and southern Iraq. The analysis and proposed solutions were the result of a 5-year program between 5 international organizations, and 5 ministries of the government of Iraq. The proposed solutions were submitted at ministerial levels, and the introduction of these reports to the participants had the objective to strengthen the conclusions from participants based on the analysis exercise from the fourth day. Further discussions were held on how the thoughts and ideas developed during the course would be used in the participants' work place.

## **ZERO and FINAL TEST ASSESSMENT**

A zero assessment has been conducted on the first day of the training. The results showed that the knowledge of the trainees was acceptable: only 1 trainee got a score under 50%, 6 trainees got a score of 50%, 4 of 60% and two reached a score of 70%.

In order to evaluate the knowledge they gained after the three weeks training a final assessment has been conducted and the result showed a tangible improvement. The percentage group score increased by 18%. Two trainees got a score of 100% when 1 trainee got a score 90%, 3 trainees were able to score 80%, 1 trainee got a score of 70%, 5 trainees got a score of 60% (amongst them 3 got the same score than the one they got during the zero assessment test) and one got the same score than the one he got during the zero assessment test of 50% (*See details in Annex III*).

## **GENERAL COURSE EVALUATION by TRAINEES**

Overall, the evaluation of the course by the participants was positive (*details in annex IV*). The list of the three most interesting ideas/concepts that the trainees learned in the course actually includes all course topics. This shows on one hand the heterogeneity in the scientific and professional background of the trainees but also that all topics were relevant to trainees. They stressed that the main relevant topics were on how to manage and solve salinity, solutions at irrigation, river basin and drainage, soil mixture and properties.

The trainees also suggested that the venue of the course should be in another country in order to provide practical sessions.

## **CONCLUSION**

The participants nominated for the course were of high quality. The participants were eager to participate.



The mixture between lectures and discussions appeared to work well, and the enthusiasm of the participants over the five day course appeared to remain high.

The course evaluations support the approach taken, and the pre and post knowledge assessment tests show an overall improvement in understanding the material.

This course should be seen as part of a capacity building approach of national governments towards salinity management.

With this objective in mind, the course is evaluated as successful by the lecturers. However, to actually improve water and land management for higher agricultural production and improved livelihoods under saline conditions, more follow-up activities, as well as a more coherent approach by international donors and organizations towards the national governments are needed.

#### **LIST of ANNEXES**

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## ANNEX I: Course Program

<b>Day 1: Sunday 2 Nov – overview, concepts and approaches</b>		
09:00 – 10:00	Opening ceremony Introductions and course overview	ICARDA and JICA representative
10:00 – 11:00	Salinity management at different scales, from basin to field	Dr. Richard Soppe
11:00 – 11:15	<i>coffee and tea break</i>	
11:15 – 12:30	Salt and water mass balance approach	Dr. Richard Soppe
12:30 – 13:30	<i>lunch break</i>	
13:30 – 14:30	Adaption versus controlling salinity	Dr. Richard Soppe
14:30 – 14:45	<i>coffee and tea break</i>	
14:45 – 16:00	CGIAR Research programs – the position of salinity management in recent research programs: Systems approach and ecosystem services	Dr. Richard Soppe
<b>Day 2: Monday 3 Nov – Integrated approach – example Australia</b>		
09:00 – 09:30	Review of yesterday's topics, questions and answers	Dr. Richard Soppe
09:30 – 11:00	Salinity management framework – the Murray-Darling Basin, Australia	Dr. Richard Soppe
11:00 – 11:15	<i>coffee and tea break</i>	
11:15 – 12:30	Discussion: Application of salinity management framework in Iraq, Egypt, Jordan and Palestine	Dr. Richard Soppe
12:30 – 13:30	<i>lunch break</i>	
13:30 – 14:30	Engineering approach to salt balances – long term estimates of soil salinity in water and soil	Dr. Richard Soppe
14:30 – 14:45	<i>coffee and tea break</i>	
14:45 – 16:00	Calculation examples and exercises	Dr. Richard Soppe
<b>Day 3: Tuesday 4 Nov – Field, district and basin based interventions</b>		
09:00 – 09:30	Review of yesterday's topics, questions and answers	Dr. Richard Soppe
09:30 – 11:00	Traditional farm based solutions (drainage, evaporation ponds) and their impact	Dr. Richard Soppe and Dr. Michel Rabeh
11:00 – 11:15	<i>coffee and tea break</i>	
11:15 – 12:30	Discussion: farmer based interventions in Iraq, Jordan, Palestine and Egypt	course participants



12:30 – 13:30	<i>lunch break</i>	
13:30 – 14:30	Solutions at irrigation district/project level	Dr. Richard Soppe and Dr. Michel Rabeh
14:30 – 14:45	<i>coffee and tea break</i>	
14:45 – 16:00	Solutions at river basin level	Dr. Richard Soppe
<b>Day 4: Wednesday 5 Nov – Shallow groundwater and salinity</b>		
09:00 – 09:30	Review of yesterday's topics, questions and answers	Dr. Richard Soppe
09:30 – 11:00	Shallow groundwater, capillary rise and salinization – the eternal cycle	Dr. Usman Awan
11:00 – 11:15	<i>coffee and tea break</i>	
11:15 – 12:30	Case study in Khorezm, Central Asia	Dr. Usman Awan
12:30 – 13:30	<i>lunch break</i>	
13:30 – 14:30	Preparation of salinity management in Iraq, Palestine, Jordan and Egypt by participants	course participants
14:30 – 14:45	<i>coffee and tea break</i>	
14:45 – 16:00	Presentation of salinity management issues in Iraq, Palestine, Jordan and Egypt by participants	course participants
<b>Day 5: Thursday 6 Nov – Iraq salinity management project</b>		
09:00 – 09:30	Review of yesterday's topics, questions and answers	Dr. Richard Soppe
09:30 – 11:00	Overview of the Iraq salinity project	Dr. Richard Soppe
11:00 – 11:15	<i>coffee and tea break</i>	
11:15 – 12:30	Activities and their results	Dr. Richard Soppe
12:30 – 13:30	<i>lunch break</i>	
13:30 – 14:30	What the future brings	Dr. Richard Soppe
14:30 – 14:45	<i>coffee and tea break</i>	
14:45 – 16:00	Closing Ceremony	ICARDA and JICA representatives