

# Biosalinity News

Newsletter of the International Center for Biosaline Agriculture

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## FROM THE EDITOR

We are all familiar with the many years of conceptualizing, planning, submitting proposals and talking to partners that takes place before a major project is successfully funded. After all the planning, it's an exciting moment when the project finally gets underway and partners meet to start implementing the project plan.

In February, it was a great pleasure to welcome the Steering Committee and Technical Committee to the first implementation meetings for the project 'Saving freshwater resources with salt-tolerant forage production in marginal areas of the West Asia and North Africa (WANA) region - an opportunity to raise the incomes of the rural poor'. Over the next four years ICBA will be devoting significant energy and resources to working with our partners to ensure that execution of this project meets both their expectations, and the expectations of donors.

In this issue we also publish a summary of the main findings of the project completed last year under the auspices of the Comprehensive Assessment of Water Management in Agriculture, coordinated by the International Water Management Institute, on the potential to use saline water for crop and forage production in four countries in West Asia and North Africa.

Finally, as always, may I remind you that The Editor welcomes short contributions on research or projects that would be of interest to readers.

Please send your submissions to:

The Editor

*Biosalinity News*, ICBA

P.O. Box 14660, Dubai, UAE

Email: [icba@biosaline.org.ae](mailto:icba@biosaline.org.ae)

## Salt-tolerant forage project gets underway



*The first meetings of the Technical Committee (left) and Steering Committee (right)*

The first meetings of the Technical Committee and Steering Committee for the four-year project 'Saving freshwater resources with salt-tolerant forage production in marginal areas of the West Asia and North Africa (WANA) region - an opportunity to raise the incomes of the rural poor' took place 19-21 February at ICBA.

The project is based on research showing that forages irrigated with saline water could be a component of sustainable agricultural systems on marginal lands and rangelands, and could improve the livelihoods of farmers in these regions. The objectives are three-fold: to increase feed availability for livestock through sustainable use of under-utilized saline water resources; to integrate the use of saline water into an overall strategy of sustainable semi-arid and arid farm system management; and to develop the capacity of national agricultural research systems.

The project, with a total cost of US\$4.09 million, is co-financed by the International Fund for Agricultural Development (IFAD), the Arab Fund for Economic and Social Development (AFESD), the OPEC Fund for International Development, a grant from the Consultative Group on International Agricultural Research Comprehensive Assessment of Water Management in Agriculture through the International Water Management Institute (IWMI), and in-kind contributions from ICBA and the National Agricultural Research Systems (NARS) of seven countries.

The IFAD grant amounts to US\$1.35 million over four years for project research in Jordan, Oman, Palestine, Pakistan, Syria and Tunisia and AFESD is contributing US\$1,000,000, again over four years, to support project research to be undertaken in Jordan, Palestine, Oman, Syria, Tunisia and the United Arab Emirates.

The OPEC Fund funds ongoing work to develop salinity-tolerant sorghum and pearl millet varieties that contributes to the project at ICBA and the International Center for Agriculture in the Semi-Arid Tropics (ICRISAT), based in Hyderabad, India. Salt-tolerant varieties have already been identified and are now being tested in Oman and the United Arab Emirates.

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International Center for Biosaline Agriculture (ICBA)

P.O. Box 14660, Dubai, UAE. • Tel: +971 4 3361100 • Fax: +971 4 3361155 • E-mail: [icba@biosaline.org.ae](mailto:icba@biosaline.org.ae)

Website: [www.biosaline.org](http://www.biosaline.org)

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Members of the Technical Committee (left) visit the genebank and members of the Steering Committee (right) visit ICBA field experiments

Dr. Mohammed Al Attar, Chairman ICBA Board of Directors, ICBA Director General and Chairman of the Project Steering Committee said "This project is the result of nearly four years of effort, consultation and collaboration between ICBA and the seven countries participating. I welcome the distinguished representatives of the project partner countries and donor agencies to the first meetings of the Technical Committee and

Steering Committee which will launch the project'.

Dr. Al Attar thanked IFAD, the Arab Fund, the OPEC Fund and IWMI for financing this project and said that he was greatly encouraged by the significant contributions that the national research organizations in the seven countries have pledged to the project in terms of their human resources and facilities.

## Salt-tolerant forage project implementation traveling workshop

The first workshop for the WANA salt-tolerant forage project, the "Traveling workshop for capacity development in project implementation" took place 23-27 April. Scientists from the participating countries, together with ICBA staff, finalized the implementation plans for 2005 for each country and developed guidelines for field implementation and monitoring.

The workshop began in Oman with presentation of the project plans in each country, and presentations and discussions on standardised data collection and monitoring.

A visit to the on-farm demonstration of forage production in saline conditions in Oman provided participants with an opportunity to observe methods and techniques for irrigation and drainage, and on-farm trials of selected salt-tolerant crops.

Participants then traveled to the United Arab Emirates where they visited ICBA field experiments and the on-farm demonstration of salt-tolerant forage crops in Ras Al Khaimah.

The next workshop, to determine the socio-economic parameters for the project, will be held at ICBA in June.



Participants of the traveling workshop inspect on-farm demonstrations of salt-tolerant forage production in Oman (left) and UAE (right)

## CONFERENCE NEWS

### Optimizing land and water resources in arid environments, Agadir, Morocco



Dr. A. Berrichi (left) and Dr. Mohammad Al Attar, ICBA Chairman of the Board of Directors and Director General (right), chairing the session on 'Salinisation and salinity/sustainable agriculture'

**O**ptimizing land and water resources in arid environments', a conference that brought scientists and researchers together with planners and managers to share experiences and exchange ideas on how to achieve optimal use of land and water resources, was held in Agadir, Morocco, 14-18 March.

The conference focused on arid environments because aridity is a factor that often exacerbates the fragility of ecosystems. Many emerging countries are dominated by arid climates and chronic droughts. The conference addressed the dilemma of finding the right balance between population growth and the need for natural resource conservation, and achieving sustainable development in such difficult situations.

ICBA's Director General gave an address in the opening session and chaired Session 4 on 'Salinisation and salinity/sustainable agriculture'. Prof. Faisal Taha presented a paper on 'Combating Salinization in Arid Regions through Innovative Technologies: Highlights of ICBA's efforts 2000 - 2004', and Dr. Sandra Child a paper on 'Capacity building in managing salinity: challenges and opportunities' in this session, and eight posters were presented during the poster session.

The Agadir Statement (see box on right) was issued at the close of the conference.

### Agadir statement March 2005: International conference on 'Optimizing land and water in arid environments'

1. Compile, promote and make use of local knowledge and techniques in the sustainable use of natural resources.
2. Strengthen the dissemination of practical techniques to end users.
3. Encourage young graduates to initiate sustainable natural resource management projects in arid regions.
4. Develop programmes for capacity building in sustainable natural resource management for different stakeholder groups.
5. Establish a think-tank involving key stakeholders (e.g. local and regional councils, professionals, and research and academic institutions) to consider regional development projects in natural resource management (e.g. eco-tourism, handicrafts, product certification).
6. Encourage regional, national and international networks for the exchange of knowledge, experience and technology relating to arid environments.

### Water, land and food security in arid and semi-arid regions, September, BARI

The international conference on 'Water, land and food security in arid and semi-arid regions' will be held at the Mediterranean Agronomic Institute of Bari, in Valenzano (Italy), 6-11 September, 2005. The conference is organized by the Centre International de Hautes Etudes Agronomiques Méditerranéennes (CIHEAM) /Mediterranean Agronomic Institute of Bari and sponsored by the Arab Water Council and the International Water Resources Association (IWRA). ICBA will organize a session on unconventional water resources chaired by Prof. Faisal Taha, Director Technical Programs.

Further information: <http://www.iamb.it>

## INTER-ISLAMIC NETWORK ON BIOSALINE AGRICULTURE (INBA)

INBA has requested \$30,000 in 2005 from COMSTECH-IDB for 'Apprenticeship for Human Capacity Building on Biosaline Agriculture in Islamic Countries'. The increasing demand for trained personnel in biosaline agriculture could be ameliorated by providing month-long apprenticeships in this specialized field. Trained personnel could in turn train others in their own country. This will benefit the private sector and improve the livelihoods of the poor in several Islamic countries. INBA envisages that COMSTECH will invite four apprentices from six or seven OIC members countries. Dr. Mohammad Al Attar and Dr. Shoaib Ismail will participate in the 12th Session of the General Assembly

## COLLABORATION

### ICBA and Turfarm, Dubai, sign agreement on turf grasses



Dr. Mohammad H. Al-Attar, Director General of ICBA (right), and Mr. Rob McFarlane, Director, Turfarm, Dubai (left), after signing the agreement

ICBA signed an agreement with M/S Turfarm, Dubai, on April 5, 2005. This agreement will cover collaboration on salt-tolerant NyPa grass (patented by NyPa) and *Paspalum* grass provided by ICBA. The signatories of the accord were Dr. Mohammad H. Al-Attar, Director General of ICBA, and Mr. Rob McFarlane, Director, Turfarm. This agreement is an extension of a Memoranda of Understanding signed between ICBA and NyPa International in 2003.

of COMSTECH, 22-24 November 2005, in Islamabad, Pakistan to report INBA activities 2004-2005.

The Inter-Islamic Network on Inter-Islamic Science and Technology Network on Oceanography (INOC) is organizing an International Workshop on 'The protection of coastal & marine environment', in Izmir, Turkey, 9-11 November 2005. The workshop is co-sponsored by the Islamic Educational, Scientific and Cultural Organisation (ISESCO) and the Institute of Marine Sciences and Technology (IMST), Izmir. For further information please contact INOC/IMST Workshop Secretariat: Postal address: Baku Bulvari 32, 35340 Inciralti-Izmir/Turkey

Tel.: +90 (232) 27 91522, Fax : +90 (232) 27 90502

Email: a.chouikhi@deu.edu.tr

Website: www.inoctr.org

## NEW ICBA BROCHURES

Copies of three recently-published brochures may be obtained from ICBA: *Project Snapshots*, *ICBA and IDB-member countries*, and *ICBA and the Islamic Republic of Iran*. The brochures may also be downloaded as pdf files from the ICBA website: [www.biosaline.org](http://www.biosaline.org)



## Joint UAEU-ICBA project wins award

The United Arab Emirates University, Research Affairs Committee, awarded the 'Best Interdisciplinary Research Project Award' to the joint UAEU-ICBA project 'Development of sustainable salt-tolerant forages for sheep and goat production' at the Sixth Annual UAE University Research Conference, 24-26 April. The project team included Dr. Salih Al-Shorepy and Dr. Ghaleb Alhadrami, of the Department of Aridland Agriculture, College of Food Systems, UAEU, and Dr. Abdullah Dakheel, ICBA Field and Forage Crops Scientist.

## RESOURCE MOBILIZATION

### Niger capacity development approved

Niger, in West Africa, is one of the poorest countries in the world. Salinity is a growing issue as current methods of irrigation result in rising water tables and salinization. As a result, many farmers are abandoning their fields.

The national agricultural research institute of Niger, the Institut National de Recherches Agronomiques du Niger (INRAN), has had a limited capacity to address these salinity issues. However, the signing of a Memorandum of Understanding between INRAN and ICBA in 2004, has paved the way for joint technology exchange activities.

The Islamic Development Bank (IDB), working with COMSTECH, has now approved a proposal for strengthening the capacity of INRAN scientists to deal with salinity. Activities will take place in several stages: a training course conducted by ICBA in Niger will be followed by internships at ICBA for the most promising participants of the course. The interns will then manage pilot field demonstration and training projects at four INRAN stations in Niger. INRAN will also be provided with laboratory and field equipment.

### ICBA visits Yemen to discuss salinity

Two ICBA scientists, Dr. Abdullah Dakheel and Dr. Bassam Hasbini, recently visited Yemen to develop principles for a bilateral project and to arrange for transfer of salt-tolerant sorghum and pearl millet germplasm for evaluation on-farm.



Forage sorghum is a common crop in Yemen

### Soil survey for the Emirate of Abu Dhabi

An agreement with the Environmental Research and Wildlife Development Agency (ERWDA) of Abu Dhabi Emirate was signed in April 2005, for joint management by ICBA and ERWDA for a soil survey of Abu Dhabi Emirate. The project is for four years. Training of UAE nationals will be an integral component of the execution of the project. ICBA is a member of the Steering Committee and will chair the Technical Committee.

### Asian Development Bank grant for CAC

Three international agricultural research centers, ICARDA, IWMI and ICBA, are collaborating on a US\$700,000 project 'Enabling Communities in the Aral Sea Basin to Combat Land and Water Resource Degradation Through the Creation of 'Bright' Spots' funded by the Asian Development Bank. ICBA will lead the tasks on germplasm and biosaline agriculture. Prof. F. Taha is co-chair of the Steering Committee and Dr. S. Ismail is a member of the Technical Committee.

### Seawater fodder production proposal for Eritrea

ICBA, Dr Gordon Sato (Rolex Awardee) and the Eritrean Ministry of Fisheries are developing a proposal for a project to produce livestock fodder with seawater. The project aims to improve the economic well-being of the villagers and scales up Dr Sato's successful work in the Manzanar project mangrove forests.



Producing mangrove biomass using a technique for fertilization developed by Dr. Sato. Bags of fertilizer are buried near the mangrove saplings and provide the nutrients required for establishment

## FOCUS ON SALINITY

### Use of saline water in agriculture to improve livelihoods in West Asia and North Africa

A summary of the findings of case studies in Egypt, Jordan, Syria and Tunisia funded by the Comprehensive Assessment of Water Management in Agriculture

West Asia and North Africa include the most water-scarce countries in the world. Per capita availability of fresh water in 1995 was less than 1000 m<sup>3</sup> per annum for most of North Africa and less than 1500 m<sup>3</sup> per annum for the Middle East, Central and South Asia. By 2025, all these areas are predicted to have less than 1000 m<sup>3</sup> per person per annum (dark red areas in Global water availability maps), many of them much less, particularly in West Asia and North Africa. Efficient and effective use of all water, including saline water, is therefore a priority for these regions.

But what factors determine when saline water can and should be used to supplement other water resources? And to what extent can saline water contribute to improved livelihoods? Case studies of the potential to use saline water for crop and forage production in four countries in West Asia and North Africa - Egypt, Jordan, Syria and Tunisia - were conducted in 2004 to answer these questions. The main findings are summarized below.

#### Factors favoring exploitation of saline water for agricultural production

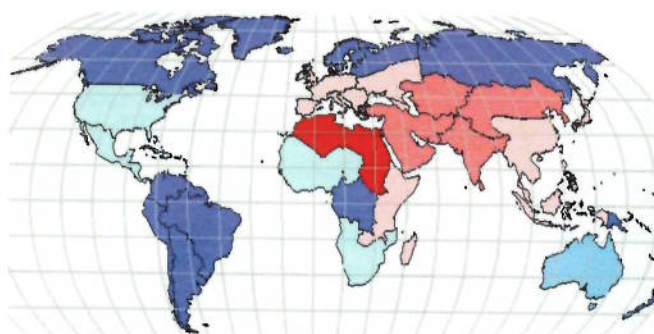
Several generic criteria can be used to identify sites with potential for agricultural production using saline water. The more criteria a site satisfies, the more likely is saline agriculture to be viable.

#### Water resources

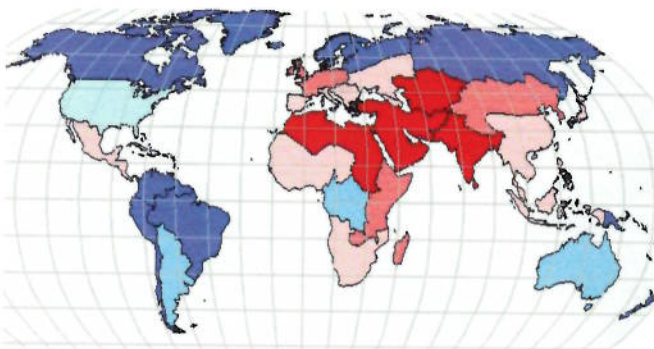
- Limited fresh water resources
- Sustainable quantities of non-fresh water available from groundwater, surface water, agricultural drainage water or other sources
- Sustainable quality of non-fresh water resource, within acceptable range for target uses
- Acceptable cost of accessing water

#### Target areas and communities

- Poor people already in situ or willing to move to the area
- Farmers willing to adopt novel practices
- Presence of development projects in the area as potential vehicles and catalysts for technology transfer
- Existing markets for agricultural products



Global water availability 1995 (Source: UNESCO)



Global water availability 2025 (Source: UNESCO)

#### Agricultural systems

- Availability of degraded or marginal land that can be devoted to saline agriculture
- Small-scale livestock farming and mixed farming with demand for feed and forage
- Availability of infrastructure, e.g. wells, irrigation and drainage systems, for effective water management
- Potential for alternative high-value production, e.g. using groundwater directly for fish farming or small-scale desalination for horticultural crops

Applying these criteria in the study countries led to identification of several areas that are considered to have high potential for use of saline water in agricultural production. The areas and the criteria for their selection are shown in Table 1.

#### Options for use of saline water

Although the study focused on direct use of saline water for agriculture - crop, tree or fish production, an important finding was that there were other significant potential uses for saline water in improving livelihood.

Table 1. Indicative prospects for agricultural production with saline water in Egypt, Jordan, Syria and Tunisia

Country	Potential area	Favoring criteria
Egypt	Central and NE Sinai (Al Arish, Sheikh Zouid, Rafa, Wadi Al Arish)	<ol style="list-style-type: none"> <li>1. Saline groundwater fed by seawater intrusion and rain</li> <li>2. Population of poor Bedouin</li> <li>3. Government policy and existing projects to settle Bedouin</li> <li>4. Existing government intervention to support small farmers hit by decline in access to Palestinian markets</li> <li>5. Existing mixed farming system (livestock, dates and vegetables) amenable to introduction of salinity tolerant forages</li> </ol>
	SE desert (north of Hurgada, between Red Sea and Nile valley)	<ol style="list-style-type: none"> <li>1. Large reserves of non-fresh groundwater</li> <li>2. Area already used to relocate landless poor</li> <li>3. Existing projects to support farmers through techniques for rainwater harvesting and storage of flash floods to supplement groundwater</li> <li>4. Existing commercial farming initiatives that are amenable to new agricultural systems (e.g. jojoba farming in Wadi Dara area)</li> </ol>
Jordan	Azraq	<ol style="list-style-type: none"> <li>1. Reserves of saline groundwater in deep aquifers and in shallow aquifers that have become saline due to over extraction of water</li> <li>2. Widespread poverty with 70-80% of population receiving government assistance</li> <li>3. Predominantly livestock farming, significant forestry areas, limited irrigated agriculture</li> <li>4. High demand for forages, currently met by importing from outside the region, particularly during winter</li> <li>5. Positive response of farmers to forage halophyte shrubs and trees introduced by earlier IAEA project</li> </ol>
	Khaldieh	<ol style="list-style-type: none"> <li>1. Saline groundwater plentiful</li> <li>2. Third poorest governorate in the country</li> <li>3. Mixed farming - irrigated summer vegetables and fruit trees, rainfed olives, large livestock herd including significant dairy industry</li> <li>4. Earlier income-diversification project faced forage shortages</li> </ol>
Syria	Margins of irrigated areas of Euphrates basin (Deir Az-Zohr to Iraqi border)	<ol style="list-style-type: none"> <li>1. Over 200 drainage wells with significant non-fresh water</li> <li>2. Large population of poor sheep herders who also own land</li> <li>3. Mixed farming systems - irrigated field crops and livestock grazed on rangelands</li> <li>4. Severe forage shortages in both good and poor rainfall seasons</li> </ol>
Tunisia	Medenine and Tataouine provinces of southern Tunisia	<ol style="list-style-type: none"> <li>1. Plentiful saline groundwater in deep aquifers (70-250 m)</li> <li>2. Population of small farmers, mainly dependent on livestock</li> <li>3. Mixed farming system of olives, field crops, forage and livestock</li> <li>4. Existing active forage markets</li> <li>5. Tataouine development project targeting development of agriculture</li> </ol>

Saline water can be desalinated for indirect use in producing high value crops or for other uses, such as drinking water in water-scarce environments. Saline water is a resource that can be used to improve the environment; for example, in afforestation or coastal rehabilitation, or for creating leisure or recreational facilities, such as golf courses, parks and nature reserves. The quantity and quality of water as well as the prevailing socio-economic circumstances determine which of these uses is most likely to be appropriate. However, production of crops is one option that could be especially promising for direct use of saline water in water-scarce environments.

#### Food, feed and forage crops that tolerate salinity

The level of salinity in the water is the prime determinant of its direct use for plant production. Higher salinity levels increasingly restrict productivity and the range of plants that can be grown, but a large number of plant species can grow and produce in the presence of salt, particularly animal feed and forage species that can fit well into livestock and mixed farming systems.

This project contributes to the Comprehensive Assessment of Water Management in Agriculture, and was supported through grants to the assessment from the governments of the Netherlands and Switzerland.

<http://www.iwmi.cgiar.org/assessment/Index.asp>

Different plant types tolerate salinity to varying degrees. Most of them react badly to salt and grow less well in its presence. However, one group of plants, the halophytes, actually prefers salt and grows better in saline conditions. Fruits and vegetables are generally sensitive to salinity and their growth and yield drop rapidly with increased levels. Field crops are generally more tolerant, are little affected by low levels of salinity, but their growth and yields diminish quite rapidly as salinity increases. Halophytes, on the other hand, show enhanced growth and yields in the presence of low and moderate salinity that only decline slowly as salinity increases; many are able to grow and reproduce in seawater.

Depending on the level of salinity, many plant species can be grown using saline land and water. The economics of production depend greatly on the specific conditions where they are found. However, there are indications that a range of plants can make profitable use of saline resources that would otherwise be unused. There are also potential environmental gains from vegetating barren land, although care must be taken to avoid negative effects of salt on soils and underlying aquifers.

#### Conclusions

Suitable plant species for saline irrigated farming systems have been identified and new types continue to be developed. Appropriate water and soil-nutrient management and agronomic practices need to be

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## CAPACITY DEVELOPMENT

### Capacity development for BARI officers

The Bangladesh Agricultural Research Institute and ICBA have been collaborating since 2003 on a project to demonstrate management solutions for saline environments in Noakhali and Sonagazi, Southern Bangladesh. A demonstration of four cash crops, tomato, chili, cucumber and watermelon was established.

As deficiencies in the installation of the irrigation system were noted in 2004, two senior officers from BARI were invited for training in irrigation systems at ICBA in February 2005. At the end of their training, the BARI officers were provided with appropriate irrigation equipment for use in the bilateral project.

### Upcoming regional workshop

A regional training course organized by ICBA and the Institut National de la Recherche Agronomique (INRA) on 'Integrated management of saline water resources and environments for forage production in the North Africa Region', with participants from Algeria, Egypt, Mauritania, Morocco, Tunisia and Libya, will be held in Rabat, Morocco 13-18 June 2005. Three days of lectures will be followed by two days of field trips to Marrakech, Tadla, Kalaa of Sraghna and the Sed Masjoun Plain. The final day will be a session to identify priorities for biosaline agriculture in North Africa.

#### Use of saline water in agriculture (continued from page 7)

worked out, however. Much of this is specific to locations and must be done on site. The economics of production are also likely to vary according to the prevailing supply and demand and need to be verified. Saline irrigated agriculture can help address poverty and food insecurity in some marginal areas, conserve soils and vegetation cover, and stimulate rural employment and stem movement of population to cities. It is therefore in the interests of governments of water-scarce countries to stimulate the introduction of saline irrigated agriculture and other uses of saline groundwater through appropriate policies, regulations and laws, ensuring coherence across all the sectors likely to be involved. These include agricultural research policies, water resource management regulations and laws, market support policies and social development policies for rural areas.

### Management of salt-affected ecosystems

A course aimed at university graduates in agricultural science, environmental engineering and environment-related specialties who are involved in management, reclamation and rehabilitation of degraded environments was held at ICBA headquarters 5-8 February 2005.



Participants of the course on 'Management of salt-affected ecosystems' at ICBA's headquarters in Dubai, 5-8 February 2005

The course 'Management of salt-affected ecosystems' was co-sponsored by the Ministry of Presidential Affairs UAE, the UAE Ministry of Agriculture and Fisheries, and the Islamic Development Bank.

Five nationals from the Ministry of Agriculture and Fisheries (MAF), two scientists from ERWDA, one from UAE University, two nationals from The Environment & Protected Areas Authority, Sharjah, and six nationals from Abu Dhabi Municipality, attended the course.

Organized by ICBA and assisted by Global Scan Technologies LLC, Dubai, the course was designed to equip participants with the skills to diagnose and characterize soil salinity problems, explore the use of remote sensing and geographic information systems in salinity mapping, and present various alternatives for management and use of salt-affected ecosystems. The course also highlighted plants that can survive in these environments.

Global Scan Technologies presented sessions on remote sensing applications for managing salt-affected ecosystems.

The UAE Ministry of Presidential Affairs and the Islamic Development Bank, provided financial support.