



# Biosalinity News

## Newsletter of the International Center for Biosaline Agriculture

VOLUME 8, NUMBER 3

DECEMBER 2007

### FROM THE EDITOR

The feature article in our final newsletter of 2007 concerns a milestone in ICBA's history. After careful deliberation, the prestigious Arab Water Council accepted ICBA as the hosting institution for the Arab Water Academy.

Reports on several high-level gatherings are also included in this issue. Among them, a workshop on small-scale irrigation for West Africa, ICBA's first training course under the auspices of the Arab Bank for Economic Development in Africa (BADEA) and an FAO-sponsored Expert Consultation.

The featured science article is authored by Dr Ian McCann of the University of Delaware along with three colleagues from our partner center ICARDA. A short article on desert farming is also included by ICBA's Plant Genetic Resource Scientists.

Eid Mubarak and Seasons Greetings to all our readers!

Contributions on research or projects of interest to our readers are always welcome, as are letters to the Editor. Please send your submissions, including relevant photographs and figures, to:

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## ICBA to host Arab Water Academy



The Governors of the Arab Water Council in session at the Oasis Beach Hotel, Dubai.

At the third meeting of the Arab Water Council (AWC), held 9-10 December in Dubai, the Board of Governors took a major decision by formally selecting ICBA as the hosting institution of the Arab Water Academy. The Secretary General of Environment Agency-Abu Dhabi (EAD), HE Majid Al Mansouri, pledged in-kind and financial support for the academy, which will be located in Abu Dhabi.

The meeting, hosted jointly by the Ministry of Environment and Water (MOEW) of the UAE and ICBA, was attended by nearly 60 policymakers and stakeholders from the region and beyond. The Arab Water Academy addresses the daunting challenges posed by

the deteriorating water supply throughout the Middle East and North Africa region.

The meeting was presided over by Dr Mahmoud Abu Zaid, Egypt's Minister of Water Resources and Irrigation, who is also the AWC President. Mr Fawzi AlSultan, ICBA Chair, and Dr Saeed Al-Kindi, Minister of Environment and Water, UAE, represented the host agencies, MOEW and ICBA.

(More photos on page 3.)

## West African research directors meet in Dubai

Senior research directors from six West African countries met 21-23 October in Dubai to participate in a seminal meeting entitled *Workshop on small-scale irrigation: Development of a regional research project for West Africa*. The workshop was supported by the Islamic Development Bank.

Delegates from the six participating countries - Burkina Faso, Gambia, Mali, Mauritania, Niger and Senegal - discussed both technical and institutional problems involved in developing small-scale irrigation in this emerging region.



Dr Bino Teme, Director General of IER, Mali's national agricultural research system, presented his country's report.

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## Desert farming: Continued quest for new crops

NK Rao and Mohammed Shahid, Plant Genetic Resources Program, ICBA

Crop diversification is the key to sustainable agricultural productivity. In the UAE, where soils are nutrient-poor, only a limited number of crops can be grown successfully. Among the new crops tried on the ICBA farm over the past year, pigeonpea [*Cajanus cajan* (L.) Millsp.] was particularly promising, as were sunflower and quinoa (reported in previous issues of this newsletter).

Pigeonpea is a leguminous shrub cultivated in the tropics and subtropics. It has a wide range of uses, including food, animal feed and fuel. In the Indian subcontinent, dried and split seeds (*dhal*) are an important source of protein. In the Caribbean and East Africa, immature pods and green seeds are used as vegetables. The vitamin A and C content of vegetable pigeonpea is five times higher than that of green peas. Pigeonpea is also an excellent forage crop because of its exceptional nutritional value and high productivity. The crude protein values of fresh pigeonpea forage range from 14 to 24%. Under intensive management, forage

production yields can exceed 50 t ha<sup>-1</sup> per annum. Pigeonpea has outstanding soil amelioration and conservation properties. The leaves are an important source of organic matter and nitrogen, reportedly adding as much as 40 kg ha<sup>-1</sup> litter to the soil. Long-duration pigeonpea can fix up to 200 kg N ha<sup>-1</sup> over a 40-week period. The crop's vigorous root system explores a large soil volume and recycles nutrients from deep in the profile. The plant's woody stems are also valuable as firewood, thatch and fencing in many areas.

Recently, ICBA acquired the minicore germplasm collection (a limited set of accessions chosen to represent most of the



**Biomass of 1-year-old pigeonpea plantation at ICBA.**



**Heavy pod bearing in a vegetable-type accession.**



**Above: Green pigeonpea seeds are more nutritious than garden peas.**



**Below: Dried and split seeds (dhal) are an important source of protein in South Asia.**

genetic diversity held in the global collection) consisting of 137 accessions from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India. These were sown in mid

November and the crop was irrigated with drip system using fresh water of about 3 dS m<sup>-1</sup>

salinity. Compost was incorporated into soil before planting, and during crop growth a single dose of urea

one month after planting and three split doses of NPK were applied by banding alongside the rows.

Vegetative growth became luxuriant with the onset of warm weather.

Considerable variation was also observed among the accessions for traits such as leaf shape, flowering pattern, and flower and seed color. This was not unexpected as the minicore collection represents the variation existing in the world

collection of about 13,000 accessions conserved in the ICRISAT genebank.

Pigeonpea holds great promise for crop diversification in the UAE. Its multiple use as food, animal feed and fuel make it a truly high-value crop. Further studies are warranted, particularly to identify genotypes adapted to the local environment and to develop suitable agronomic and management practices for commercial production. ICBA would be happy to make available small quantities of seeds for agriculturists and horticulturists who are interested in trying out this versatile crop.



**Pigeonpea inflorescence with showy flowers**



## LETTERS TO THE EDITOR

Readers of this newsletter will recall that in the last issue, the Editor issued a challenge to identify the exact species of the famous 'Tree of Life' in Bahrain. Our challenge did not go unanswered.

Dear Sir,

Thank you for publishing my letter of enquiry about the Tree of Life in Bahrain. Since I last wrote to you, having consulted various organizations, particularly the Doubleday Research Station near Warwick and their guide to Prosopis species, I now believe the tree is a Prosopis, not an Acacia as I initially thought.

*P. juliflora* was probably introduced into the Gulf in the 1930s, so I think the 400-year-old specimen in Bahrain must be *P. cineraria*.

Your request hopefully will elicit responses and usefully is linked to your previous article on *The Dry Land UAE Flora Survey* which identifies many *P. cineraria* but only a single *P. juliflora* in the region. Durham University surveys in the 1990s in Oman identified similar species distribution.

Most importantly, however, is the correct scientific name for the stately old tree to encourage interest in the relevance of accurate scientific nomenclature in determining future biological conservation programmes.

Kind regards, Richard Smith

Dear Sir,

The August 2007 edition of Biosalinity News raised questions: What could the Tree of Life be? Which Acacia species, or is it Prosopis? If somebody would send me a small branch (with a few leaves) and some fruits, I would try to tell you what it is. Postal address is below.

Best greetings,

Prof Dr SW Breckle

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Dear Sir,

Further to the letter from Richard Smith about the Tree of Life in Bahrain in your August issue:

1. A person in Bahrain who can probably make a positive identification of the Tree of Life in Bahrain is Professor Dr Jameel Abbas, at the University of Bahrain. Maybe he is willing to assist.
2. Wikipedia describes the tree as *Prosopis juliflora*, which is indeed widespread throughout the Gulf, and was introduced from Central America. From the photo in your article it also looks like *P. juliflora*.
3. Other natural *Prosopis* species that I know from Bahrain are *P. farcta*, and possibly *P. koelziana*, although as yet this species is unreported. It is not difficult to identify *P. juliflora*, and differences to *Acacia* are pretty obvious. This is probably *P. juliflora*.
4. *Prosopis* can have extremely deep roots to reach permanently moist soil layers. That is one source of water,

**The Tree of Life flourishes where no other sign of life can be seen anywhere.**



Photo by Brian J McMorrow

even if the groundwater is saline. *P. juliflora* can grow and reproduce in salinity equivalent to 75% seawater. The second source of moisture is condensing air-humidity at night when the leaves open their stomata. Bahrain has very high air-humidity rates throughout the year.

Best regards,

Benno Boer, UNESCO Office, Doha, Qatar

### More photos from the Arab Water Council Governors' Meeting



ICBA Chair Mr Fawzi AlSultan receiving a memento from Dr Mahmoud Abu Zaid, President of the Arab Water Council.



Minister Al Kindi with Dr Abu Zaid and other delegates.

## BADEA workshop promotes ties to sub-Saharan Africa

Under the generous sponsorship of the Arab Bank for Economic Development in Africa (BADEA), ICBA hosted a workshop on *Biosaline agriculture technologies for arid and semi-arid regions with reference to Africa* for 15 representatives of nine sub-Saharan African countries: Angola, Botswana, Kenya, Lesotho, Mozambique, Senegal, Sierra Leone, Tanzania and Zimbabwe. The workshop, which was held from 27 October to 8 November, included hands-on modules in both field and



**Left: Field visit to the Dibba Agricultural Research Station.**

**Below: ICBA Irrigation Technician Basel Al'raj answers questions in the field.**

laboratory, as well as several field trips to UAE government research facilities.

Representing BADEA at the closing ceremony were Mr Ahmed Khogali Ahmed Nur and Dr Zuhair Tawfic Saffo.



**The Zimbabwean representative receives her Certificate of Participation from Dr Saffo.**

## IDB officials visit ICBA

On 2 December, ICBA hosted a meeting with two Executive Directors of the Islamic Development Bank. Hon Mohammad Azzaroog Rajab (left) and Hon Dr Waleed Al Wohaib (right) were escorted around the ICBA farm by Deputy Director General Dr Ahmed Almasoum.



## ICBA signs with First AFG

On 30 September, ICBA signed a Project Agreement with First AFG, a California-based company with a strong commitment to combating desertification by developing new saline water treatment technologies in agriculture. Together, First AFG and ICBA will undertake an *Evaluation of the First AFG treated salt water for crop and forage production at ICBA Research Station.*

The agreement, which came into force on 1 October, will last for a period of one year. Dr Nurul Akhand, Irrigation Management Scientist, will serve as the ICBA Focal Point.



**First AFG expertise in monitoring salinity is internationally acclaimed. Only a few days after the signing ceremony, the company installed the salinity monitoring device in the photograph. Data obtained thus far are very encouraging.**



**Mr Naim M Ismail, Managing Director of First AFG, shakes hands with ICBA Deputy Director General Dr Ahmed Almasoum after signing the project agreement.**



## STAFF NEWS



**Dr Ahmed Almasoum** joined ICBA as Deputy Director General in September. Dr Almasoum, a citizen of the UAE, has 30 years of experience in agriculture as both researcher and educator. After obtaining his PhD in Horticulture from the University of Arizona,

he undertook postdoctoral fellowships at Texas A&M University and Ohio State University. He has served in senior positions in the UAE government and with United Arab Emirates University. He has published in various international and regional journals.



**Mr Sahajad Ilahi Ansari**, General Maintenance Technician (left), and **Mr Sameen Gul**, Driver (right), both joined ICBA in May. Mr Ansari is from India, Mr Sameen is from Pakistan.



**Ms Diane Giessen**, Administrative Assistant (left), left ICBA in December

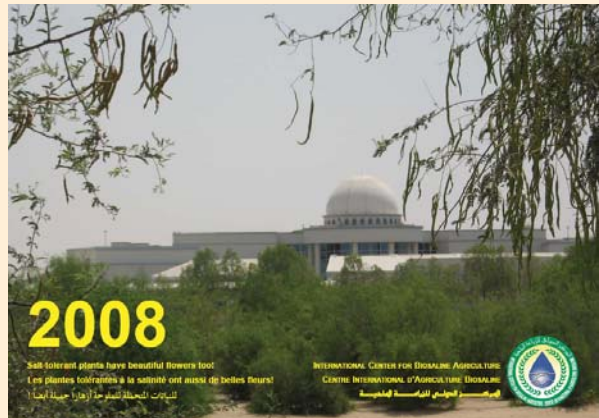


to accept a position in the private sector. **Ms Irene Galang** (right), left the center at year's end to dedicate herself to raising her family. Ms Giessen served ICBA for 3 years, and Ms Galang for 2 years. We wish them both all success in their future endeavors.

On 8 December, **Dr Kristina Toderich**, Plant Scientist and manager of ICBA's Tashkent office, received the prestigious Order of Dostlik for achievements in science development and promotion of international collaboration. The Order was presented on the occasion of the 16th Anniversary of the Republic of Uzbekistan's Independence Day. In the photograph, the Order is presented to Dr Toderich by Dr Sanakulov Kuvanduk, Vice Premier, Ministry of the President. The entire team of ICBA congratulates Dr Toderich on her achievement.



## PUBLICATIONS



ICBA's 2008 wall calendar features photographs of the flowers of various salt-tolerant plants. The text is rendered in English, Arabic and French.

An update of *Project Snapshots*, a capsule summary of each current research project, has been printed in English. An Arabic translation is under preparation.



## FOCUS ON WATER USE

# Supplemental irrigation of winter crops in a Mediterranean climate

Ian R McCann<sup>1</sup>, Adriana Bruggeman<sup>2</sup>, Theib Y Oweis<sup>2</sup> and Mustafa Pala<sup>2</sup>

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This article has been abstracted from a paper entitled *Modification of the FAO-56 spreadsheet program for scheduling supplemental irrigation of winter crops in a Mediterranean climate*. The paper was accepted in 2007 by the American Society of Agricultural and Biological Engineers for publication in the *Journal of Applied Engineering in Agriculture*. Dr McCann, the corresponding author, whose photograph appears on the left, can be contacted at [mccann@udel.edu](mailto:mccann@udel.edu).

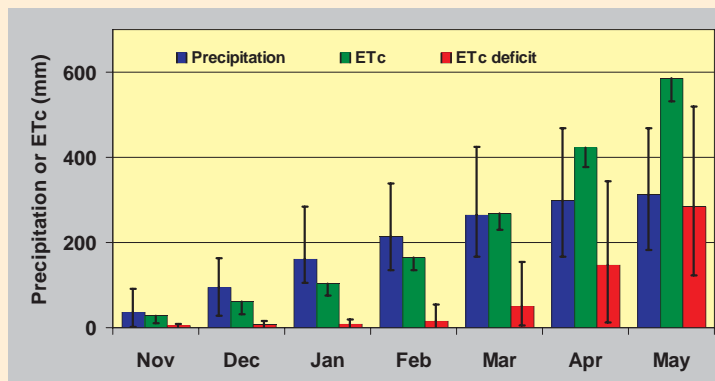
The Mediterranean region, which includes countries in southern Europe, North Africa and the Middle East, experiences a climate characterized by cool temperatures, rainfall and low-reference evapotranspiration ( $ET_0$ ) during the winter; and high temperatures, little or no rainfall and high  $ET_0$  during the summer. Annual rainfall is significantly lower than annual  $ET_0$ .

Cropping systems encompass the entire range from rainfed to fully irrigated. Irrigation enables more profitable crop production, but uses large amounts of water. Increasing population, urbanization and industrialization within the region is putting pressure on the limited water resources. Because irrigation consumes a large portion of the region's total water use and because water will be increasingly diverted from agriculture for use in other sectors, any reduction in irrigation water use through improvements in efficiency will help maintain production levels with less water.

Although well-managed irrigation has national and regional benefits from a water productivity viewpoint, farmers worldwide tend to apply excess water in order to eliminate the risk of yield losses from applying too little. This is particularly so where the incremental cost of applying irrigation water is low compared with the economic return farmers can realize from increased yield. Surface water supply systems often provide water on a fixed schedule at low cost, and groundwater is often available for the cost of pumping it

without regard to its sustainable use. Other factors may also impact irrigation decisions, such as equipment and labor availability.

An example of a Mediterranean climate, which shows cumulative rainfall and crop evapotranspiration ( $ET_c$ ) for wheat for Tel Hadya (the site of ICARDA's headquarters near Aleppo, in northern Syria) is presented in Figure 1. The cumulative daily  $ET_c$  deficit remains negligible from November (the beginning of the growing season) until March, but after March  $ET_c$  increases rapidly and rainfall decreases, resulting in a rapid increase in the deficit. One of the most efficient uses of water is to supplement winter rainfall in areas like Tel Hadya where rainfed production is possible but where yields are limited by water stress in the latter part of the growing season.



**Figure 1: Cumulative daily precipitation, wheat ET and ET deficit during the growing season at Tel Hadya. The bars show the value at the end of each month averaged over the 27 seasons from 1979/80 to 2005/06. The error bars show the corresponding minimum and maximum values.**

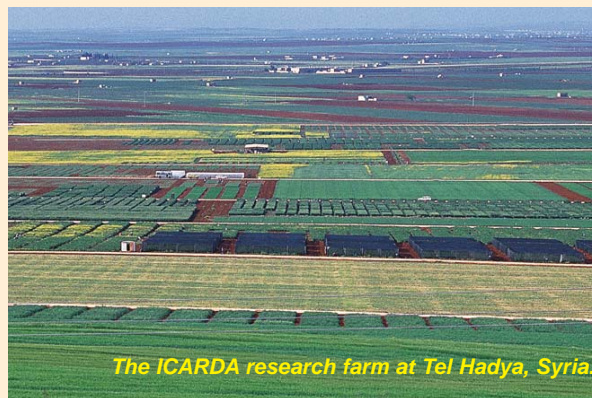
Irrigation scheduling is more difficult when rainfall provides a significant amount of the water used by the crop. Irrigation is under the control of farmers or associated organizations, but rainfall cannot be controlled. Many computer models have been developed to help schedule irrigation. A prerequisite for models is weather data. The internet has enabled easy access to up-to-date weather information and evapotranspiration estimates from automated climate stations, making the use of ET-driven water balance models for irrigation scheduling more generally applicable. Examples of online networks include:

- ③ CIMIS (California Irrigation Management Information System, [www.cimis.water.ca.gov](http://www.cimis.water.ca.gov))
- ③ AGRIMET ([www.usbr.gov/pn/agrimet](http://www.usbr.gov/pn/agrimet)) in the northwest states, USA
- ③ AEMN (Automated Environmental Monitoring Network, [www.griffin.uga.edu/aemn](http://www.griffin.uga.edu/aemn)) in Georgia, USA
- ③ Department of Agriculture and Food, Western Australia ([www.agric.wa.gov.au](http://www.agric.wa.gov.au))

In most countries in the Mediterranean region, however, no such system currently exists, and few services are available to assist farmers with their day-to-day irrigation decisions. Simple and robust methods are therefore urgently needed that can be used by agricultural research and extension personnel to provide farmers with real-time irrigation scheduling advice and to help make sound water allocation decisions. Timely support from USAID Linkage Funds makes has now made this goal achievable.

*FAO Irrigation and Drainage Paper 56* (Allen et al. 1998) is a standard reference for  $ET_c$ . It provides a comprehensive description of the widely accepted Penman-Monteith method for estimating  $ET_0$  from data on air temperature, humidity, wind speed and solar radiation; and procedures for computing  $ET_c$  under standard and non-standard (stressed) conditions. This publication includes a spreadsheet program for irrigation scheduling under standard conditions. The program is available from the University of Idaho website at [www.kimberly.uidaho.edu/water/fao56/index.html](http://www.kimberly.uidaho.edu/water/fao56/index.html). This model is readily available, well documented and very useful for cropping systems in which irrigation is readily available and is the major source of water for the crop. It has limitations, however, when irrigation is used to supplement rainfall as in a Mediterranean climate, and where other constraints exist concerning when and how much to irrigate.

In the case of supplemental irrigation of winter crops in Mediterranean countries, the soil profile, particularly



near the surface, is very dry in the fall. When the crop is planted, typically in November, the first rains have wetted the surface to allow germination. A relatively light irrigation at planting is an option farmers may consider necessary to ensure adequate crop establishment. No additional irrigations are normally needed until the onset of spring. Rainfall during the winter is generally sufficient to meet crop water requirements and provide some recharge to the soil profile for later use by the crop. However, the depth of wetting may be insufficient to allow root development at the same rate as under full irrigation. During dry years or when rain is poorly distributed, stress occurs during winter and early spring. There are also practical constraints that might not apply to a fully irrigated production system. For example,

*It is worth mentioning that this model is not about salinity. Models such as Saltmed have been specifically developed for salinity, but because these are generally more comprehensive models and not spreadsheets, they may have different users.*

farmers may not usually apply frequent light irrigations because of the high labor cost. Instead, once the weather starts warming up and rainfall events become less frequent, farmers will apply a few large irrigations sufficient to refill the root zone.

Our specific objectives were to build upon the FAO-56 spreadsheet program to (i) modify and evaluate it for scheduling of supplemental irrigation in a rainfed Mediterranean environment, and (ii) evaluate the effect of uncertainties in the model's input parameters on its usefulness as an irrigation and water management tool in the region.

Modifications were incorporated that limit the growth of the root system when the soil is too dry, and which allow infiltrated rainfall to be stored within the potential root zone so that it can be accessed by the crop later in the season when the root depth has increased. The modified model was tested using a 4-year dataset collected at ICARDA, evaluated with 27 years of daily weather data and with various assumptions about soil depth and water holding capacity showed that it has the potential for use in training and as an irrigation decision support tool at the farm level and at the level of strategic planning on irrigation water use.



## Donor meeting in Beijing

The Annual General Meeting of the Consultative Group on International Agricultural Research (CGIAR) was hosted over the first week of December by the Chinese Academy of Agricultural Sciences in Beijing. ICBA was represented by Board Chair Mr Fawzi AISultan, Director General Dr Shawki



Barghouti, Director of Technical Programs Dr Faisal Taha and Communications Specialist Eric McGaw.



*Clockwise from above: Mr AISultan with Franklin Moore of USAID; Dr Barghouti with Minh-Long Nguyen of IAEA; Dr Taha with Kathy Sierra, CGIAR Chair.*



## Swedish Academy calls on ICBA

On 12 November, ICBA was honored by a visit by 18 members of the Swedish Academy of Science. The academicians were led by Dr Professor Lena Treschow Torell, President of the Academy (in the light green jacket) and escorted by HE Bruno Beijer, Swedish



Ambassador to the UAE (fourth from the right in the photograph to the right). The group visited ICBA trials in the field, the greenhouses and the genebank.

## Expert Consultation

The FAO's global network on Salinization Prevention and Productive Use of Salt-affected Habitats (SPUSH), along with ICBA and the Inter-Islamic Network on Biosaline Agriculture (INBA), organized the First Expert Consultation on *Advances in assessment and monitoring of salinization for managing salt-affected habitats* at ICBA headquarters from 26 to 29 November. Experts in various fields came from all over the world to read papers pertaining to the problems of salinity. Countries represented included China, Egypt, India, Iran, Jordan, Hungary, Kenya, Mexico, Morocco, the Netherlands, Oman, Pakistan, Romania, South Africa, Spain, Tajikistan, Tanzania, Thailand, the USA and Uzbekistan.

The Organizing Committee is to be commended for an excellent job of putting together this important meeting of minds on one of the paramount agricultural constraints worldwide. Members of the committee were Dr Clemencia Licona Manzur and Dr Amin Mohamed Mashali from the FAO, and Prof Dr Faisal Taha and Dr Shoab Ismail from ICBA.

