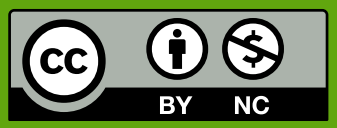
نـزرع للغـد
ICBA
AGRICULTURE FOR TOMORROW

A Year in Focus: Impact Report | 2020

Citation
This publication should be cited as: ICBA. (2021). A Year in Focus: Impact Report 2020. Dubai, United Arab Emirates: ICBA.

Creative Commons License



A Year in Focus: Impact Report

2020

Contents

H.E. Razan Khalifa Al Mubarak
Chair of the Board of Directors

Dr. Tarifa Alzaabi
Acting Director General

Foreword from the Board Chair and the Acting Director General

2020 will surely go down in history as a year defined by the Covid-19 pandemic. So profound was its impact that there was no lack of superlatives used by policymakers, pundits, and journalists.

While the pandemic brought to a halt many sectors of the global economy, its consequences for food security were a cause of great concern as international, regional, and local food supply chains were seriously affected. This, in turn, made many governments and organizations rethink their approaches to ensuring food security and prioritize domestic agricultural production more than ever before.

But the health crisis also accelerated many positive trends, including digitalization. Familiarity with virtual meetings and online learning facilitated ICBA's efforts to improve farming practices globally.

Like many other institutions around the world, ICBA managed to adapt its operations to the new reality and take advantage of the digital technologies early on. This helped to make sure that not only did the center's projects continue with minimal disruption, but that the center was able to increase efficiencies.

With preventive measures and contingency plans in place, ICBA continued to work with its partners to alleviate poverty and food insecurity among rural farming communities in different parts of the world.

The center carried out 57 SDG-aligned projects focused on technology and knowledge transfer, targeting stakeholders in Central Asia, the Middle East, North Africa, and sub-Saharan Africa. Nearly all contributed in one way or another to the targets of SDG 1 (No Poverty) and SDG 2 (Zero Hunger).

To help smallholder farmers mitigate and adapt to salinization and climate change, the center carried on with a multi-stakeholder project to introduce salt- and drought-resistant crops and agronomic management practices in Botswana, The Gambia, Liberia, Mozambique, Namibia, Sierra Leone, and Togo.

And in Morrocco, scientists reached a significant milestone after five of the center's quinoa genotypes were registered and certified as varieties by the country's National Food Safety Office. This opened the way for commercial cultivation of the genotypes in the country following successful multi-year trials. As part of efforts to develop value chains for halophyte-based food products in the UAE, ICBA supported a group of farmers in Abu Dhabi in adopting an integrated agri-aquaculture approach to grow Salicornia, a halophytic crop, and fish using reject brine from desalination units.

Scientists also worked to improve water use and management in different countries. Under a multi-stakeholder project in Jordan, for example, they promoted innovative water-saving technologies to help farmers reduce water and energy consumption.

In Burkina Faso, Mali, Niger and Senegal, ICBA scientists collaborated with their local counterparts to introduce solar-powered irrigation systems, helping 100 small-scale vegetable growers to better water their fields and subsequently increase their yields.

All this work was accompanied by individual and institutional capacity development. ICBA hosted 40 interns from nine countries and organized online and in-person technical training courses for 154 specialists from 14 countries. More importantly, the first cohort of 22 women scientists from counties including Algeria, Egypt, Jordan, Lebanon, Morocco, and Tunisia graduated from the Arab Women Leaders in Agriculture fellowship program. This is a regional initiative aimed at creating more opportunities for Arab women professionals and narrowing the labor gender gap in agricultural sciences in the Middle East and North Africa.

These achievements were possible thanks to strong partnerships established over the years. And the center continued to expand its network of partners, having signed 32 new cooperative agreements with various organizations. For instance, to increase the reach of its training offerings, ICBA teamed up with the FAO elearning Academy, a dedicated platform providing courses that are fully aligned with the Agenda 2030 for Sustainable Development.

We attribute all these successes to three key ingredients: the dedication of our staff, the collaboration of our partners and the support of our donors. We thank everyone for helping us make a positive change, especially in the lives of smallholder farmers and rural populations. And we look forward to continuing to deliver on our shared vision of sustainable livelihoods and food security in marginal environments.


ICBA

ICBA at a glance

VISION
Sustainable livelihoods and food security in marginal environments

MISSION
To work in partnership to deliver agricultural and water scarcity solutions in marginal environments

STRATEGIC OBJECTIVES

- Promote sustainable management of natural resources
- Enhance agricultural value chains
- Provide climate change solutions
- Advance sustainable food, feed & biofuel agri-technologies

ICBA is an international not-for-profit applied agricultural research center with a unique focus on marginal environments where an estimated 1.7 billion people live. It identifies, tests and introduces resource-efficient, climate-smart crops and technologies that are best suited to different regions affected by salinity, water scarcity and drought, among other factors.

Since its formation in 1999, the center has implemented projects in some 40 countries in Central Asia, the Middle East, North Africa, South Asia, the South Caucasus and sub-Saharan Africa.

ICBA has also expanded its network of partners around the world to increase the reach and impact of its work. It has partners in more than 50 countries, enabling it to leverage a vast and diverse pool of expertise to achieve lasting outcomes on the ground.

It is a founding member of the Association of International Research and Development Centers for Agriculture, a nine-strong alliance focused on increasing global food security by supporting smallholder agriculture within healthy, sustainable and climate-smart landscapes.

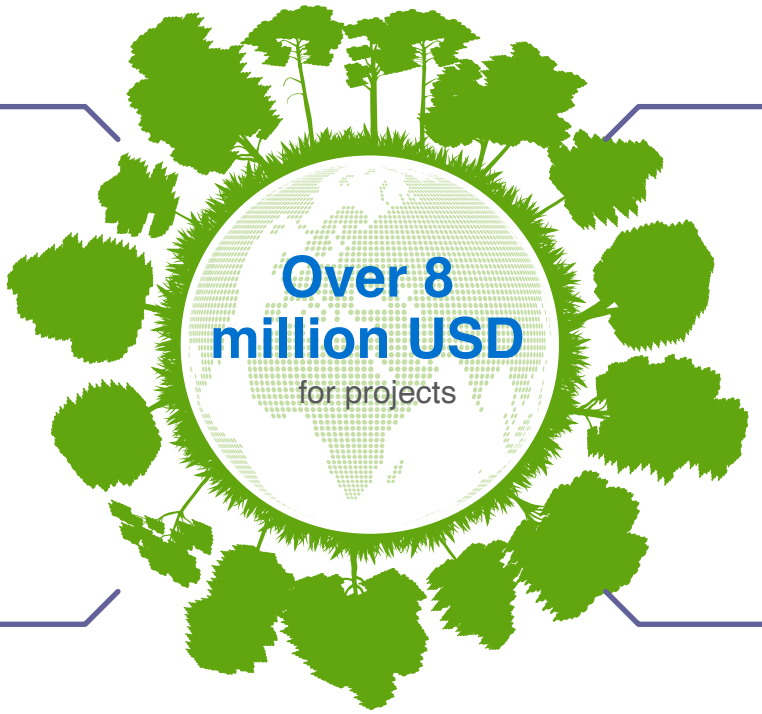
AIRCA
Association of International Research and Development Centers for Agriculture

Through its work, ICBA helps to create jobs, and improve livelihoods, food security and nutrition for some of the poorest rural communities around the world.

ICBA contributes to the achievement of seven Sustainable Development Goals:

2020 in numbers

57
projects



32
new collaborative agreements

241
mentions in leading news outlets

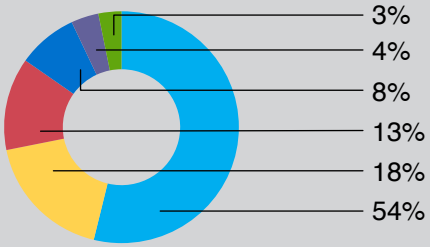
154
participants at five special technical training courses, including 102 women, from 14 countries

53
research publications

35 beneficiary countries*

* This also includes beneficiaries of capacity development programs.

Funding Sources



- UAE Government
- Islamic Development Bank
- Other External Donors
- International Fund for Agricultural Development
- Mercy Corps**
- Other Income***

** The full list of supporters and contributors is presented on page 104.

*** This includes interest income and income from the Emirates Soil Museum.

In 2020 the global extreme poverty rate rose for the first time in over 20 years.

End poverty in all its forms everywhere

Up to 124 million people were pushed back into extreme poverty in 2020 due to the pandemic, with South Asia and sub-Saharan Africa accounting for most of the increase*.

The trend shows how extreme poverty is becoming more concentrated in these two regions which are home to around 80 percent of all people living on less than 2 USD a day.

Most of the extremely poor in rural areas rely on smallholder or subsistence farming. And it is estimated that there are more than 608 million smallholder farming households globally**.

Lacking adequate skills and resources to farm sustainably and profitably, these people are most vulnerable to climate change and other risks to agriculture.

To help them lift themselves out of poverty, it is important to equip them with necessary skills, crops and technologies so that they can better manage risks and produce enough food to eat and sell.

* United Nations Statistics Division. (2021). End poverty in all its forms everywhere. https://unstats.un.org/sdgs/report/2021/goal-01/
** Food and Agriculture Organization of the United Nations. (2021). Small family farmers produce a third of the world's food. https://www.fao.org/news/story/en/item/1395127/icode/

Soil salinity and lack of water for irrigation take a heavy toll on the livelihoods of smallholder farmers in Ethiopia and South Sudan.

Shedding new light on causes of smallholder hunger and poverty in Ethiopia, South Sudan

Small-scale agriculture forms the backbone of the rural economy in Ethiopia and South Sudan as most households depend on it for food and income. Yet it is getting less and less profitable and appealing due to a range of challenges, including soil salinity and lack of water for irrigation.

In fact, soil salinity and water scarcity are leading to hunger and poverty among many smallholders according to a study* conducted by ICBA jointly with the Ministry of Agriculture of Ethiopia, the Ethiopian Agricultural Research Institute and the Directorate of Research and Training of South Sudan.

Based on the results of a survey of more than 500 farming households, with the majority owning less than 2 hectares of land, the study points out that lack of water for irrigation and its poor quality are the main causes of salinization in both countries.

In Ethiopia, smallholders reported that soil salinity decreased agricultural productivity by 50 to 100 percent, with other factors including poor land leveling and drainage. And in South Sudan, over 90 percent of the respondents put low yields down to the shortage of water and equipment for irrigation.

Alas, the economic and social costs stemming from this situation are rising. Agricultural production is between 30 and 80 percent lower than what it could otherwise be. Many lose hope and abandon their lands, ending up in a vicious circle of hunger and poverty. The loss of income hits women and children hardest.

More and more rural households in these areas are becoming dependent on food aid programs run by national and international organizations. But growing demand is putting a strain on these organizations.

These problems also force male members of the households to move to cities in search of work.

Nevertheless, the study offers some hope too. It notes that there are effective ways to increase agricultural production on degraded lands. For example, moderately salinized areas can be reclaimed by improving irrigation and crop management, while biosaline agriculture approaches might be useful on highly salt-affected soils.

Dr. Asad Qureshi, a senior irrigation scientist at ICBA, says: "The cultivation of salt- and drought-tolerant forages is one solution to dealing with salinization and water scarcity in Ethiopia and South Sudan. It is also important given sizeable livestock sectors in these countries."

This is surely good news for thousands of smallholders who need their land and livestock for food and income. And it is an opportunity that local governments could grasp.

* Qureshi, S. A., Mohammad, M. & Abdallah, J. M. (2018). Baseline socio-economic survey in the salt-affected areas of Ethiopia and South Sudan (Project Report No. 1). International Center for Biosaline Agriculture. https://www.biosaline.org/sites/default/files/project-report-1-final-redused.pdf

Helping smallholders cope with soil salinity in sub-Saharan Africa

Smallholders produce up to 80 percent of the agricultural output in sub-Saharan Africa. For them, farming is both a means of livelihood and a source of food. So vital they are to the food supply chains that anything that undermines their agricultural productivity is also a serious risk to the majority in the region who consume their produce.

They face a host of challenges to their agricultural activities. But salinization stands out for its scale and impact. The territory affected by salinity in the region is estimated to be at over 19 million hectares*. The causes vary from inappropriate irrigation practices to seawater intrusion.

To help smallholders mitigate and adapt to salinization, ICBA is implementing a multi-stakeholder project in several sub-Saharan African countries to support small-scale producers in tackling the impacts of soil salinity and climate change.

Scientists are using a participatory approach involving all beneficiaries at every stage of the project implementation. As part of this work, they started establishing best practice hubs together with local partners in the project countries. They also helped to form groups of 50 pioneer farmers to encourage their greater involvement in the project activities. These farmers will be directly engaged in testing and evaluating salt-tolerant crops and agri-technologies. What is more, their knowledge of local food preferences and markets will guide the selection of the most appropriate salt-tolerant crops and agri-technologies.

Dr. Khalil Ammar, Program Leader on Sustainable Natural Resources Management at ICBA, says: *"Salinization is one of the major problems affecting agricultural production in sub-Saharan Africa. It has an adverse impact on rural livelihoods, economies and sustainable development in the region. That is why ICBA is working with various research, extension and government organizations to provide smallholders with skills, tools and resources to better manage and rehabilitate salt-affected lands, and thus make a difference in their lives and livelihoods."*

The project aims to introduce salt- and drought-resistant crops and agronomic management practices in rural communities in Botswana, The Gambia, Liberia, Mozambique, Namibia, Sierra Leone and Togo.

It is also designed to facilitate the creation of value chains for new crops and develop the capacities of smallholders and extension workers in salinity management and climate-smart agriculture.

Called "Improving Agricultural Resilience to Salinity through Development and Promotion of Pro-poor Technologies" (or RESADE), the project is currently financed by the International Fund for Agricultural Development and targets farming households in The Gambia, Liberia, Mozambique, Sierra Leone and Togo.

It is expected that the project will reach around 11,550 smallholders, increasing the productivity of their lands by 30 percent and economic returns by 20 percent.

* Tully, K., Sullivan, C., Weil, R. & Sanchez, P. (2015). The State of Soil Degradation in Sub-Saharan Africa: Baselines, Trajectories, and Solutions. Sustainability, 7, 6523-6552. doi:10.3390/su7066523

Salinization poses a serious threat to the livelihoods of smallholder farmers in sub-Saharan Africa.

Barley is one of the staple crops in Tunisia.

Salt-tolerant barley shows promise for raising farmers' yields, incomes in Tunisia

Like in other North African countries, water scarcity, climate change and soil salinity are considered to be some of the major constraints on crop production in Tunisia. This is especially true of staple crops as they tend to be more sensitive to abiotic stresses. Barley – an agricultural mainstay used for food, feed and malt production – is no exception.

So, it is important to find and introduce more resilient crops and varieties that can do well under unfavorable conditions. For example, salt-tolerant crops can help small-scale farmers in salt-affected areas to increase their yields and incomes.

This was the objective of a study led by scientists from ICBA in collaboration with researchers from the National Agronomic Institute of Tunisia. Using AquaCrop, a crop growth model developed by the Food and Agriculture Organization of the United Nations, scientists were able to assess the performance of two varieties of barley: a salt-sensitive one called Konouz from Tunisia and a salt-tolerant one called Batini from Oman.

The study was conducted with water at various levels of salinity in three regions of Tunisia: Beja, a sub-humid region; Kairouan, a semi-arid region; and Medenine, an arid region. The results showed that Batini performed much better than Konouz in arid salt-affected environments.

Dr. Zied Hammami, a research agronomist at ICBA, says: *"We found that the irrigation cost in salt-affected areas can be reduced by 40, 38 and 49 percent by cultivating the salt-tolerant variety at salinity levels of 5, 10 and 15 deciSiemens per meter respectively. Moreover, in arid areas with a salinity level of 15 deciSiemens per meter, Batini can produce 2 tonnes of grain per hectare. In contrast, Konouz is limited to about 0.7 tonnes per hectare."*

The study is an important step towards supporting the adaptation of smallholder farmers to the effects of salinization and climate change. It will also contribute to the country's efforts to boost barley production in arid salt-affected areas where saline groundwater is used for irrigation.

Scientists in Uzbekistan patent new quinoa seed processing machine

Processing quinoa seed for food and cultivation may soon become easier and cheaper in Uzbekistan and other Central Asian countries thanks to a simple yet innovative machine developed by a group of inventors, including scientists from ICBA.

Jointly designed and built by the Scientific Research Institute of Mechanization and Electrification of Agriculture, Tashkent State Agrarian University and ICBA, the invention was granted a patent by the Intellectual Property Agency at the Ministry of Justice of Uzbekistan.

It can perform such functions as threshing, hulling, air cleaning, gravity separating, vibratory sieve separating and grading. It maximizes cleaning efficiency and minimizes wear and tear. It also runs on electricity and has the capacity of cleaning about 3-5 tonnes of seed per hour. More importantly, the machine can produce quinoa seeds that meet quality standards in terms of size and purity.

Quinoa is one of the most nutritious crops and has proven itself an excellent alternative with considerable biodiversity. It can adapt to different environments, including marginal ones that are most vulnerable to climate change, water scarcity and salinity.

As part of its global quinoa program, ICBA has conducted research on the crop since 2007. The center has identified and developed five genotypes suited to various agro-ecological conditions. In recent years, ICBA has introduced these genotypes in different countries, including Kyrgyzstan, Tajikistan and Uzbekistan.

As a result, farmers' interest in the crop has been gradually growing in the region. And production is expected to increase in the coming years.

ICBA is now focusing on scaling up local value chains for quinoa. However, one of the main challenges faced by farmers, particularly smallholders, is postharvest processing as they do not have necessary equipment for threshing, seed cleaning and other purposes. So, most of the processing is done manually, which sometimes discourages farmers from growing such crops.

According to Dr. Aziz Karimov, Head of ICBA's Regional Office for Central Asia and South Caucasus: "Since quinoa production is new to Central Asia, specific machinery has not been developed in the past to help resolve the technological challenges that hinder seed processing and the market for such technologies has been limited. Farmers are reluctant to cultivate a new crop for which there is no postharvest processing technology. We hope that this invention will facilitate the adoption and expansion of quinoa production in the region."

Initially designed to clean quinoa seeds, the machine can also be used to clean seeds of other crops such as amaranth, alfalfa and other small-seed crops.

The machine was developed under the project titled "Cross-regional Partnerships for Improving Food and Nutritional Security in Marginal Environments of Central Asia". Funded by the Islamic Development Bank, the project was implemented by ICBA between 2013 and 2018.

EXTIROGA

PATENT

ПАТЕНТ НА ИЗОБРЕТЕНИЕ

O'ZBEKISTON RESPUBLIKASI ADLIYA VAZIRLIGI HUZURIDAGI INTELLEKTUAL MULK AGENTLIGI
АГЕНТСТВО ПО ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ ПРИ МИНИСТЕРСТВЕ ЮСТИЦИИ РЕСПУБЛИКИ УЗБЕКИСТАН

№ IAP 06249

Ushbu patent O'zbekiston Respublikasining ixtirolar, foydali modellar va sanoat namunalari to'g'risida"gi Qonuniga asosan quyidagi ixtiroga berildi:

Настоящий патент выдан на основании Закона Республики Узбекистан «Об изобретениях, полезных моделях и промышленных образцах», на следующее изобретение:

Кишлоқ хўжалик экинлари уруғини ажратадиган қурилма
Устройство для выделения семян сельскохозяйственных культур

Talabnoma kelib tushgan sana: 04.03.2016
Дата поступления заявки:

Talabnoma raqami: IAP 2016 0076
Номер заявки:

Ustuvorlik sanasi: 04.03.2016
Дата приоритета:

Patent egasi (egalari): Кишлоқ хўжалигини механизациялаш ва электрлаштириш илмий-тадқиқот институти, UZ
Научно-исследовательский институт механизации и электрификации сельского хозяйства, UZ

Ixtiro muallif(lar): Росабоев Абдумаджар Тухтамуминович, Мулдашев Ортик Комилович, Кристиан Тодорич, Каюпов Ботир Бахтиярович, Имомкулов Умиджон Боймаматович, Пардаев Обид Рахимбобоевич, UZ
Автор(ы) изобретения:

Patent O'zbekiston Respublikasining barcha hududida 04.03.2016 yildan patentni kuchini kamida 5 yil muddatga to'langanligiga 20 yil muddatga e'tirof etiladi.
Действие Патента Республики Узбекистан распространяется на всю территорию Республики Узбекистан при условии оплаты пошлины за поддержание в силе не менее чем за 5 лет с 04.03.2016 года.

Direktor
Директор

Т. Абдусаттаров

INTELLEKTUAL MULK AGENTLIGI

The invention is expected to facilitate the adoption and expansion of quinoa production in Central Asia.

Between 720 and 811 million people faced hunger in the world in 2020.

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

The pandemic had a major impact on food security worldwide. As many as 161 million people joined the ranks of the world's hungry. Globally, nearly one in three people were affected by moderate or severe food insecurity in 2020*.

More than half of the world's undernourished were found in Asia and more than one-third in Africa. South Asia, East Africa and sub-Saharan Africa had the highest levels of undernourishment.

Climate change-induced drought, salinization and other factors threaten food security in these and other regions where small-scale agriculture provides most of the food. As staple crops produce little or fail, rural communities are faced with undernourishment and hunger.

*United Nations Statistics Division. (2021). End hunger, achieve food security and improved nutrition and promote sustainable agriculture. https://unstats.un.org/sdgs/report/2021/goal-02/

Faced with environmental constraints on agriculture, smallholder farmers in Morocco are taking up quinoa production.

ICBA's quinoa genotypes get go-ahead for commercial cultivation in Morocco

Following successful multi-year trials in Morocco, five quinoa genotypes from ICBA were registered and certified as varieties by the country's National Food Safety Office (L'Office National de Sécurité Sanitaire des Produits Alimentaires).

As a result, ICBA was able to sign its first material transfer agreement with Ben Rim Farm, a local agribusiness, on commercial seed production and grain processing of the varieties - ICBA-Q1, ICBA-Q2, ICBA-Q3, ICBA-Q4 and ICBA-Q5 - in the country.

Dr. R. K. Singh, Program Leader on Crop Diversification and Genetics at ICBA, says: "This is an important achievement as quinoa is a highly nutritious and climate-resilient crop with great potential for boosting yields and incomes of small-scale farmers in Morocco. It is specifically suited to areas where salinization and drought have a severe impact on crop production. Around 30 percent of the irrigated land in the country suffers from varying degrees of salinity, with some estimates putting economic costs above 0.2 billion USD per year. So, we hope to see this crop adopted on a larger scale as a means to deal with these challenges."

As ICBA's genotypes produce, on average, around 3 tonnes of seed per hectare compared with 1.6 tonnes of seed per hectare for locally grown genotypes, an increasing number of smallholders are cultivating it. And scientists are helping farmers to increase their net profits. Thanks to mechanization, for example, they have managed to reduce production costs from 2.62 to 1.89 USD per kilogram.

The certification is a significant milestone as it paves the way for developing quinoa value chains in the country. This is a result of consistently good performance of the varieties under local conditions during trials conducted as part of ICBA's quinoa project in Rehamna Province between 2017 and 2020.

Funded by Canada's International Development Research Centre, the project was implemented by ICBA in collaboration with the Mohammed VI Polytechnic University and the Ministry of Agriculture, Fisheries, Rural Development, Water and Forests of Morocco.

As more farmers learn about quinoa and start growing it, they will worry less about drought and salinization. They will also be able to produce enough to eat and sell.

Quinoa offers hope to smallholders in Ethiopia's salt-affected areas

ICBA's quinoa genotypes are just the job for addressing the problem of low agricultural productivity in Ethiopia's salt-affected areas according to a study* by ICBA and the Ethiopian Institute of Agricultural Research.

The genotypes can help reclaim salt-affected areas and contribute to food security and nutrition in the country.

This is good news for a nation which ranks first in Africa in terms of the territory affected by salinity. It is estimated that some 11 million hectares of land are salinized**, causing agricultural losses of 10 to 80 percent.

As part of the study, a team of researchers from ICBA and the Ethiopian Institute of Agricultural Research evaluated five genotypes - ICBA-Q1, ICBA-Q2, ICBA-Q3, ICBA-Q4 and ICBA-Q5 - for salinity tolerance, nutritional value and yield under different soil salinity conditions. The experiments were carried out in open field and greenhouse conditions. The researchers found that three genotypes (ICBA-Q3, ICBA-Q4 and ICBA-Q5) could grow satisfactorily under soil salinity levels of up to 20 deciSiemens per meter and overall showed promising results in terms of biomass production (between 15 and 30 grams of dry biomass per plant) and grain yield (between 10 and 20 grams of grain per plant) in the country's dry and hot conditions.

According to Dr. Asad Sarwar Qureshi, a senior irrigation scientist at ICBA and the lead author of the study: "Quinoa is rich in nutrients, tolerant of salinity, and requires much less water than major staple crops. That is why ICBA, along with its partners, has been introducing the crop in many countries of the Middle East, North Africa and Central Asia. In Ethiopia, the farmers who cultivated quinoa in their fields as part of the study were happy and expressed a great interest in the crop because it provides fodder for animals and healthy grains for human consumption."

As the country plans to set up large-scale irrigation schemes without adequate drainage facilities, there is a high risk that soil salinity will worsen. So, it is important to reclaim saline soils and bring them back into use and prevent good soils from salinization.

It is also necessary to develop agricultural value chains for salt-tolerant food and forage crops to increase food production in salt-affected areas and help smallholder farmers to feed their families and livestock.

ICBA is now collaborating with the Ministry of Agriculture of Ethiopia and the Ethiopian Institute of Agricultural Research to prepare a strategy for expanding quinoa production in the country. Several national agricultural research institutes have also joined the efforts and started producing quinoa seeds for free distribution among farmers.

---

* Qureshi, S. A. & Daba, W. A. (2020). Evaluating Growth and Yield Parameters of Five Quinoa (Chenopodium quinoa W.) Genotypes Under Different Salt Stress Conditions. Journal of Agricultural Science, 12 (3). https://doi.org/10.5539/jas.v12n3p128

**Daba, W. A. & Bedadi, B. (2016). Studies on Soil Physical Properties of Salt Affected Soil in Amibara Area, Central Rift Valley of Ethiopia. International Journal of Agricultural and Natural Sciences, 3 (2), 8-17. https://www.researchgate.net/publication/330322339_Studies_on_Soil_Physical_Properties_of_Salt_Affected_Soil_in_Amibara_Area_Central_Rift_Valley_of_Ethiopia

Quinoa's exceptional resilience and nutritional profile make it an attractive alternative for crop production on salt-affected lands in Ethiopia.

Dubbed 3N, the initiative represents three key actions: grow, harvest and share.

New community initiative supports food security efforts in UAE

As the pandemic brought food security and nutrition to the fore around the world, ICBA undertook a community initiative aimed at raising awareness about sustainable agriculture and contributing to broader efforts on food security in the UAE.

As part of the initiative, the center worked with local partners and authorities to reach a diverse group of beneficiaries through different activities.

Jointly with the Emirates Red Crescent, for example, ICBA distributed a large amount of produce from its fields and greenhouses: 4 tonnes of dates; 1.6 tonnes of fresh vegetables, including cucumber and capsicum; 400 kilograms of watermelon; as well as 7 tonnes of pearl millet green fodder and 5.2 tonnes of forage produced from halophytic grasses and crops like Salicornia and amaranth.

To encourage youth to learn more about farming, the center provided 200 units of ready-to-grow sandboxes for home gardening to a number of individuals and organizations such as the Ajman Youth Center and the Sharjah Center for Learning Difficulties.

What is more, through its social media platforms, ICBA promoted best practices in soil and water management and crops suited to local conditions, as well as shared tips and instructions on how to grow food at home.

Dr. Tarifa Alzaabi, Acting Director General of ICBA, says: *"We really wanted to give back to local communities in these unprecedented times. So, with this initiative, we tried to do our part in fostering generosity and stimulating interest in farming at home.*

We also aimed to highlight healthy eating habits and engage youth in agricultural activities. We were delighted to see that we were able to reach a large segment of people of different ages. I would like to thank the Emirates Red Crescent, Advanta Seeds and other partners for their great support for our initiative."

Launched on Zayed Humanitarian Day, 3N reflected the humanitarian vision of Sheikh Zayed Bin Sultan Al Nahyan, the founding father of the UAE, and served as a means to give back to local communities, especially in view of the pandemic.

Developing value chains for halophyte-based food products in UAE

As many farmers in the UAE resort to desalination to meet their freshwater needs, they produce large amounts of reject brine, a harmful by-product. This poses an environmental challenge and exacerbates soil and water salinization. But scientists at ICBA are trying to put reject brine to good use.

Under a project funded through the Expo 2020 Dubai's Expo Live Innovation Impact Grant Program, ICBA is helping farmers in the emirate of Abu Dhabi to grow Salicornia, a halophytic crop, and fish using reject brine from desalination units. The project is designed to support the development of value chains for halophyte-based food products.

Launched in 2019, the project has supported eight farms in producing Salicornia and tilapia using an approach based on integrated agri-aquaculture systems.

According to Dr. Hassan Khalil Oudah, a farm owner from Abu Dhabi: "The first trial of growing Salicornia with reject brine from the desalination system was excellent. The agricultural practices were easy to follow and did not involve much effort. The model can be utilized on all farms with desalination systems without high costs for farm owners. Moreover, it provides healthy products for human and animal consumption. In my opinion, if we could set up a factory, it will have high returns for the farmers and be good business for investors."

Called "From desert farm to fork: value chain development for innovative halophyte-based food products", the project is implemented in collaboration with the Abu Dhabi Agriculture and Food Safety Authority, the Khalifa Fund for Enterprise Development, the Environment Agency – Abu Dhabi and the Global Food Industries LLC.

The project aims to facilitate public-private partnerships to develop value chains for halophytic crops like Salicornia in the UAE, making use of saline water and barren land.

Since 2014 ICBA has implemented a research program on inland and coastal integrated agri-aquaculture systems in the country to study the use of reject brine and seawater for farming. The inland system uses desalinated water for vegetables, reject brine for tilapia, and then fish effluent for halophytes for food and feed. The coastal system uses seawater directly to grow fish and the resultant effluent to irrigate halophytes such as Salicornia.

Halophytes, or salt-loving plants, can be irrigated with reject brine and seawater.

Women make up, on average, around 50 percent of the agricultural labor force in East and Southeast Asia, as well as sub-Saharan Africa and North Africa.

Achieve gender equality and empower all women and girls

Women account for an average of 43 percent of the agricultural labor force in developing countries. But just 13 percent of the farmland holders worldwide are women.

The majority of women farmers are either unpaid family workers or paid laborers. These women were hit hardest by the pandemic, with many being left indebted and hungry*.

If all women farmers had the same level of access to productive resources as men do, they could increase yields on their farms by 20-30 percent, lifting 100-150 million people out of hunger**.

From the labor of agriculture to the science of agriculture, women's potential around the world remains largely untapped.

* ActionAid. (2020, October 16). World Food Day: Women farmers most at risk from Covid-19 food crisis. https://actionaid.org/news/2020/world-food-day-women-farmers-most-risk-covid-19-food-crisis
** United Nations. (2011, March 7). Women could feed millions more people if given access to means of production – UN. https://news.un.org/en/story/2011/03/368252-women-could-feed-millions-more-people-if-given-access-means-production-un#:~:text=Women%20in%20rural%20areas%20have,United%20Nations%20report%20released%20today.

First cohort of Arab women scientists graduates from regional fellowship program

Twenty-two women scientists from six countries graduated from the Arab Women Leaders in Agriculture fellowship program after almost a year-long learning journey that began in 2019.

To celebrate their achievements, ICBA hosted a special ceremony on International Women's Day.

During ten months, the fellows from Algeria, Egypt, Jordan, Lebanon, Morocco and Tunisia undertook an intensive curriculum, including 12 online modules and face-to-face workshops in Tunisia and the UAE, designed to equip them with research, leadership and other skills for professional growth.

Funded by the Islamic Development Bank, the Bill & Melinda Gates Foundation and the CGIAR Research Program on Wheat, the program was launched in response to the existing gender gap in science in the Middle East and North Africa.

While women account for 21 percent of the total labor force and contribute 18 percent to the region's overall GDP, they are heavily underrepresented in the research and development sector. Empirical evidence shows that there is a disproportionately low number of women in science. The average share of women scientists across the region stands at 17 percent, which is the lowest in the world.

Being the first of its kind, the Arab Women Leaders in Agriculture fellowship program aims to help narrow the gender disparity in science and thus boost innovation in the region. It is designed to support women researchers in spearheading positive changes in agriculture and food security.

Mr. Hassan Damluji, Deputy Director at the Bill & Melinda Gates Foundation, says: "Empowering women to take up leadership positions in all fields, particularly critical sectors like agriculture and science, is an essential lever towards achieving gender equality globally. AWLA is a wonderful example of partners coming together to deliver concrete solutions that help break down barriers for Arab women researchers."

The program's long-term goal goes beyond capacity development and includes improved food security and nutrition, a better research and development landscape, and economic and social benefits of a narrowed gender gap in the region.

The Arab Women Leaders in Agriculture fellowship program is specially tailored for early- and mid-career women scientists from the Middle East and North Africa.


ICBA
AGRICULTURE FOR TOMORROW
Roughly a third of the world's population lives in water-stressed countries.

Ensure availability and sustainable management of water and sanitation for all

In 2020 771 million people did not have access to basic drinking water, with half of them in sub-Saharan Africa*. The pandemic underscored the need for access to water for a healthy, green and sustainable recovery.

As climate change is shifting weather patterns, water supplies are set to decline and droughts to intensify. This poses a serious threat to food security of some 3.2 billion people who live in agricultural areas facing high and severe water scarcity.

Against this backdrop, it is worrying that freshwater resources and aquifers are being depleted and degraded.

* United Nations Statistics Division. (2021). Ensure availability and sustainable management of water and sanitation for all. https://unstats.un.org/sdgs/report/2021/goal-06/

The prototype uses saline water for cooling and irrigation.

ICBA starts testing saltwater-based greenhouse prototype

Scientists at ICBA began the trial of a saltwater-based greenhouse prototype for growing vegetables. The system features an environmentally friendly technology in which, at one end, saline water passes through a porous wall made of pozzolan bricks, and, at the other end, fans suck in air from outside through a cold wall, thus creating a cooling effect inside the greenhouse.

What is more, the system uses a natural method known as a psychrometric process to convert warm saline water, which moves through pipes exposed to the sun, into humid air; the moist air is then tapped to create root zone moisture in the soil for vegetable production.

While the system is currently on trial at ICBA, scientists intend to carry out further research to find solutions to the shortcomings of the system and conduct a thorough analysis of return on investment to demonstrate its economic feasibility.

If the trial is successful, the system may prove to be a new way to reduce pressure on scarce freshwater resources in the Middle East and North Africa.

The region is home to 12 out of the 17 most water-stressed countries in the world. It also has the greatest expected economic losses from climate-related water scarcity, estimated at 6-14 percent of GDP by 2050.

More worryingly, projections suggest that by 2050 renewable water will fall below 500 cubic meters per capita and arable land to 0.12 hectares per capita.

It is, therefore, important to find solutions to use alternative sources of irrigation such as saline water for agriculture. And innovations like the saltwater-based greenhouse prototype give hope that this might be possible soon.

Water-saving technologies increase farmers' profits in Jordan

A multi-stakeholder project is helping farmers in two Jordanian governorates to make considerable water and energy savings through innovative solutions.

Under the project called "Water Innovation Technologies", ICBA is working with Mercy Corps, Jordan River Foundation, Royal Scientific Society and the International Water Management Institute to improve water use efficiency using a market system development approach on farms in Mafraq Governorate and Azraq district, Zarqa Governorate. Funded by the United States Agency for International Development, the project also involves the private sector, specifically suppliers of water-saving technologies and service providers.

The center is training suppliers and service providers in delivering customized solutions to farmers who grow olives and stone fruits. This work is contributing to stimulating the demand for water-saving technologies and practices by influencing farmers' behavior. As a result, farmers are reducing water consumption and associated costs.

Dr. Khalil Ammar, Program Leader on Sustainable Natural Resources Management at ICBA, says: *"Unfortunately, many farmers in Jordan overirrigate their fields. So, we want to show that they can save a lot of water and energy by using water-efficient innovations. This will help to sustain groundwater use, lower production costs, and increase their profits."*

And there are already some encouraging results. For example, one of the farmers, Mr. Abu Kishek, managed to save about 158,490 cubic meters of water and around 20,422 Jordanian dinars (around 28,804 USD) on his electricity bills between March 2018 and January 2020. His farm is now a popular site among neighboring farm owners like Mr. Fadel Al Mughairbi.

According to Mr. Fadel Al Mughairbi, his investment in the upgraded irrigation systems resulted in saving 619,630 cubic meters of water and 79,843 Jordanian dinars (around 112,614 USD) on his electricity bills from April 2018 to January 2020.

Thanks to such success stories, 46 farmers monitored by ICBA have adopted water-saving technologies since the project was launched in 2017.

Overall, the project aims to help save about 18.5 million cubic meters of water by 2022 by addressing constraints on the adoption of water-saving technologies in agriculture and households.

More and more farmers in Jordan are learning how to cut down on water and energy consumption using water-saving technologies.

Smallholders in Burkina Faso are using solar-powered irrigation systems to increase agricultural productivity and income.

Solar-powered irrigation systems improve livelihoods in sub-Saharan Africa

Most farmers in sub-Saharan Africa cultivate small plots of land, less than 2 hectares. What they produce is usually enough to feed their families and sometimes sell. But as precipitation is low and agricultural conditions are poor, they heavily depend on irrigation. This is where the main challenge lies.

While wells and rivers are the main source of water for most of the irrigated farms, transporting it to the fields is a big hurdle in terms of infrastructure and finance.

There are, however, effective low-cost solutions that can help farmers to water their lands and boost crop yields and incomes. They can also help to minimize their risks.

This is the idea behind a project funded by the OPEC Fund for International Development and implemented by ICBA in four sub-Saharan African countries: Burkina Faso, Mali, Niger and Senegal. Called "Scaling up small-scale irrigation technologies for improving food security in sub-Saharan Africa", the project promotes small-scale irrigation technologies such as the Californian irrigation system and on-farm water management strategies to improve water use efficiency.

Dr. Asad Qureshi, a senior irrigation scientist at ICBA, says: *"We are trying to help smallholder farmers bring water to their fields at a low cost. But also, because there is no electricity in these rural areas, we are installing solar-powered pumps. What is really important is that the system saves about 40 percent of water compared to traditional surface irrigation systems."*

Under the project, ICBA introduced the solar-powered systems among groups of smallholder farmers in the four countries. As a result, 100 smallholders have begun using the Californian system since the project was launched in 2016.

Smallholders also formed associations to manage water distribution and collectively supply local markets with their produce.

As part of the project, scientists also determined crop water requirements and irrigation schedules to help farmers and extension specialists better manage water resources.

These practices and technologies can reduce water use by 20 percent and increase yields by 15 percent.

They show potential for improving the livelihoods of smallholder farmers in the region. And a growing interest among them is a very positive sign. But they hope for government support as even these low-cost systems are often out of their reach.

2020 was the hottest year in recorded history worldwide.

Take urgent action to combat climate change and its impacts

Global climate data shows that 2011-2020 was the warmest decade on record. And 2020 became the hottest year despite an abrupt decline in carbon dioxide emissions worldwide during the pandemic*.

As the planet is heating up, the prospect of food insecurity looms large in many countries. Farmers the world over are already bearing the brunt of climatic extremes. The hotter and drier the weather becomes, the higher the chances are of crop yield reduction or failure and livestock loss. Extreme events such as droughts, heat waves and floods are becoming more frequent and intense in many Middle Eastern and African countries, causing immense social and economic damage.

* National Aeronautics and Space Administration. (2021, January 14). 2020 Tied for Warmest Year on Record, NASA Analysis Shows. https://www.nasa.gov/press-release/2020-tied-for-warmest-year-on-record-nasa-analysis-shows

Droughts are getting more frequent and extreme in the Middle East and North Africa due to climate change.

Supporting drought planning and mitigation in Middle East, North Africa

Climate change poses high risks to agriculture and water security in the Middle East and North Africa as it increases extreme weather events like drought. As a result, the livelihoods of millions of smallholder farmers are at stake.

Already being the most water-stressed region in the world, the Middle East and North Africa is experiencing more frequent and extreme dry spells. It is cause for serious concern as most countries depend on rainfall for food production. Over the past few decades, several countries have witnessed recurrent droughts resulting in significant economic losses. Yet much of the damage could have been averted if there had been adequate and timely mitigation measures in place.

Lack of accurate data for drought monitoring and preparedness makes things more difficult. This means that decision-making and action is often delayed and is not appropriately targeted. This is the reason behind efforts by ICBA to help countries in the region establish operational drought monitoring systems. For example, the center has assisted government institutions in Jordan, Lebanon, Morocco and Tunisia in operationalizing their drought monitoring systems under the project called "Middle East North Africa - Regional Drought Management System" funded by the United States Agency for International Development.

Between 2015 and 2019, ICBA built the capacities of local experts and decision-makers in producing and analyzing data on soil moisture, vegetation health and rainfall for drought monitoring. Scientists also generated Composite Drought Index maps and derived products, which were integrated into drought management processes in the four countries*. What is more, ICBA helped to set up drought management units.

The data from the Composite Drought Index maps and derived products is now generated on a monthly basis using satellite products and surface modeling capabilities to monitor the vegetation conditions and rainfall across the region. ICBA is also working with the Food and Agriculture Organization of the United Nations to make these solutions available to other countries that did not participate in the project and disseminate five products such as normalized difference vegetation index, Composite Drought Index, rainfall, soil moisture and evapotranspiration through the Regional Knowledge Platform of the Food and Agriculture Organization of the United Nations and the center's own data portals.

These maps and datasets can be used by relevant ministries in the region for water and crop management, and scientists and students for research purposes.

According to Mr. Rashyd Zaaboul, a climate modeling scientist at ICBA: "Drought is one of the most devastating climate-related risks in the region. Almost all countries rely on precipitation for agriculture and are among the most vulnerable in the world to drought. Having such tools and data is a must for decision-makers in the region to proactively manage the negative effects of drought."

The regional drought monitoring system is a result of ICBA's collaboration with the United States Agency for International Development, the National Drought Mitigation Center and the Center for Advanced Land Management Information Technologies of the University of Nebraska - Lincoln, the Daugherty Water for Food Global Institute, and the Food and Agriculture Organization of the United Nations.

ICBA intends to continue to improve the system and make it more accessible to all partners in the region and beyond.

* United Nations Convention to Combat Desertification. (2020). Plan National Sècheresse Tunisie. https://www.unccd.int/sites/default/files/country_profile_documents/Drought_Management_Plan_Tunisia_Final.pdf

New tool aids in decision-making on rainfed agriculture in Middle East, North Africa

Soil moisture is almost everything for rainfed agriculture. It is a key factor determining crop productivity. It is especially important in rainfed areas of the Middle East and North Africa as the region faces water scarcity. Most farmers practice rainfed agriculture and depend heavily on moisture available at the root zone level.

Root zone soil moisture data is, therefore, necessary for scheduling irrigation times, forecasting crop yields, and especially early warning of droughts. This type of data is also critical as several countries have experienced extreme dry spells caused by climate change in the past years.

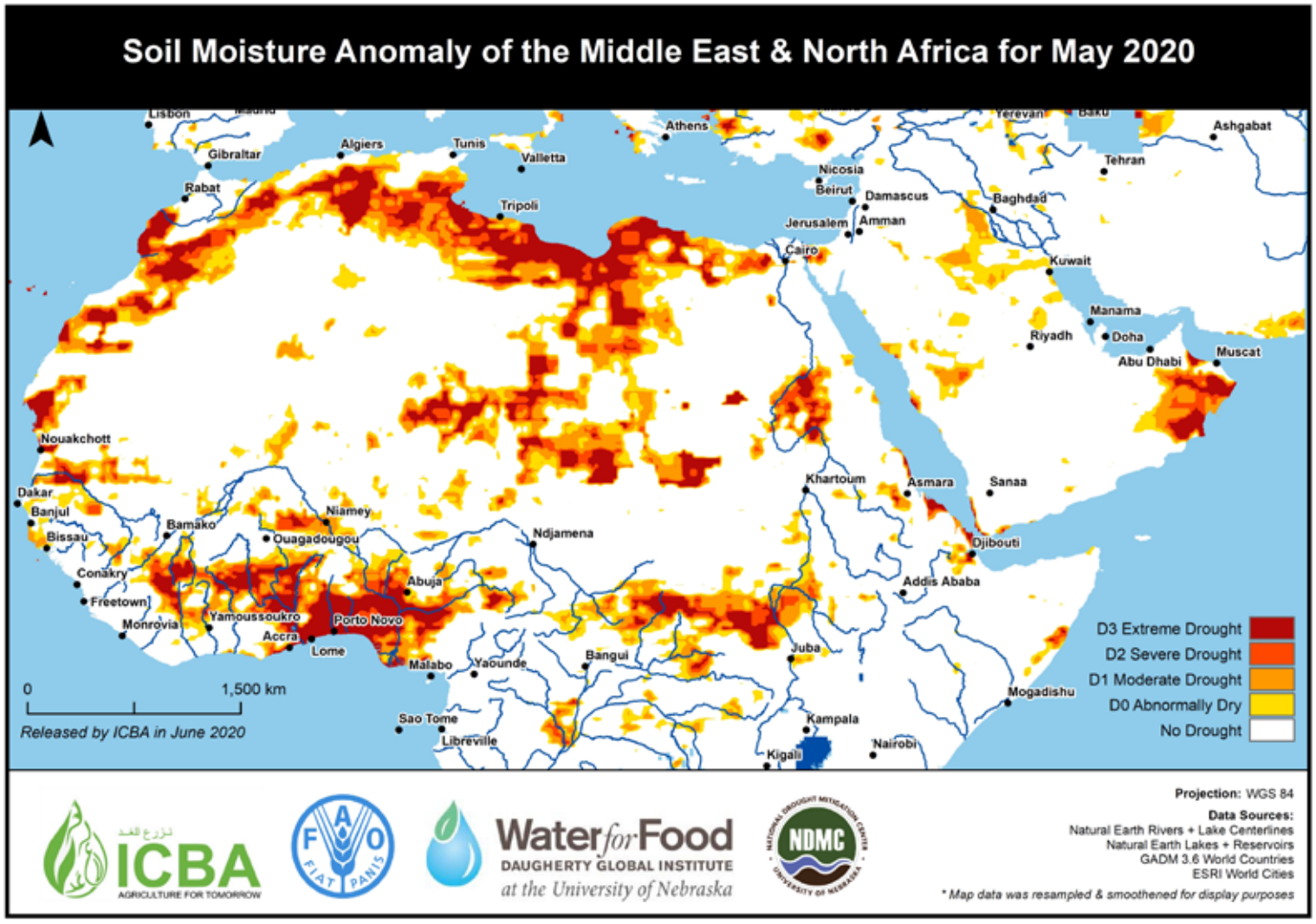
Alas, this data is hard to measure using satellites alone. Satellite-generated data covers only a few centimeters of topsoil. To address this problem, several tools have been developed in different countries to assess root zone soil moisture on the local, regional and global scales. To support this work, ICBA has also adapted an open-source product called Land Information System to generate more accurate root zone soil moisture data for rainfed areas of the region. This root zone soil moisture product is a result of years of the center's collaboration with the National Aeronautics and Space Administration.

Since 2012, ICBA has worked with the National Aeronautics and Space Administration to customize its Land Information System software to the climatic conditions in the region. The system is an ensemble of surface models that assess the hydrological cycle on different scales starting from the 1-kilometer resolution upwards. Over the years, ICBA has generated root zone soil moisture data at the 5-kilometer spatial resolution and sub-daily temporal resolution for the entire region for the period of January 2000 up to the present.

The product serves as one of the main components for the regional drought monitoring system developed by ICBA under the project titled "Middle East North Africa - Regional Drought Management System" funded by the United States Agency for International Development.

Currently, drought management units in Jordan, Lebanon, Morocco and Tunisia use root zone soil moisture data produced by ICBA as one of the inputs for their national drought monitoring systems.

The good news is that the root zone soil moisture product can also be used in other countries with rainfed agriculture and help researchers, insurance companies and water users to plan their day-to-day operations and make short- and long-term planning.



Scientists at ICBA generate root zone soil moisture data at the 5-kilometer resolution for the entire Middle East and North Africa.


Today biodiversity is declining faster than at any other time in human history.

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Biodiversity is under serious threat as a result of human activities. Alas, the world fell short of meeting its targets to halt biodiversity loss in 2020*. Yet the pandemic showed what might happen to humanity when biodiversity is threatened. So alarming is the current rate of biodiversity loss that some scientists suggest a sixth mass extinction in Earth's history is under way.

Agrobiodiversity, a vital sub-set of biodiversity, is also in decline. The diversity of crops present in farmers' fields has fallen and threats to crop diversity are increasing. In view of climate change, this diversity is crucial for global food security and nutrition.

It is critically important to preserve biodiversity in general and agrobiodiversity in particular for a sustainable and food-secure future.

* United Nations Statistics Division. (2021). Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. https://unstats.un.org/sdgs/report/2021/goal-15/

Preserving agrobiodiversity for food security in marginal environments

Agrobiodiversity, a sub-set of biodiversity, is crucial for the future of food and agriculture. It is more important than ever before as the world is going through climate crisis and environmental degradation.

To resolve hunger and undernutrition, especially in marginal environments, it is necessary to diversify into underutilized, neglected and forgotten crops that are naturally better at withstanding biotic and abiotic stresses and are in many cases more nutritious. Quinoa, a super crop from the Andes, is a great example. In less than a decade it has entered the menus around the world. It is more resilient and nourishing than staple crops like wheat, rice and corn.

ICBA has been at the forefront of promoting crop diversification for the past two decades as it holds the key to sustainable food production and healthy diets under a changing climate. The center has introduced climate-smart and resource-efficient crops like quinoa, pearl millet, sorghum and Salicornia, among others, in countries of Central Asia, the Middle East, North Africa and sub-Saharan Africa to help smallholder farmers and rural communities to improve their agricultural production.

More importantly, ICBA has collected and preserved germplasm of plant species with proven or potential salinity, heat and drought tolerance from around the world since the establishment of its unique genebank in 2000. Today this genebank is home to one of the world's largest collections of germplasm of drought-, heat- and salt-resistant plant species. It stores some 15,400 accessions of around 270 plant species from more than 150 countries and territories. This also includes around 280 seed samples of 70 wild and cultivated plant species from the UAE.

The genebank is also part of the Multilateral System of Access and Benefit-sharing within the framework of Article 15 of the International Treaty on Plant Genetic Resources for Food and Agriculture - the world's largest global gene pool of plant genetic material, available to farmers, plant breeders and scientists for the sustainable production of food from plants.

Dr. Mohammed Shahid, a geneticist at ICBA, says: "Plant genetic resources are critical for food security. But unfortunately, climate change, population growth, urbanization and other factors are leading to their decline. So, we must take action to preserve them as they form the building blocks of sustainable food systems."

ICBA also provides seed samples to different institutions around the world for research, breeding and introduction. To date the center has distributed 8,572 seed samples to partner organizations in 57 countries.

Scientists at ICBA also work to document and preserve plant genetic resources in the UAE. For example, they have been able to identify, study and preserve the seeds of four local cereal landraces (one of barley and three of wheat) in the emirate of Ras al-Khaimah, save the local genotype of Halfa grass (Desmostachya bipinnata) from possible extinction, and report eight plant species previously unknown to exist in the country.

All this work is crucial for efforts to ensure food security and nutrition in marginal environments today and tomorrow. It is important to protect and preserve biodiversity in general and agrobiodiversity in particular so that humanity has solutions that nature can offer to the current and future challenges.

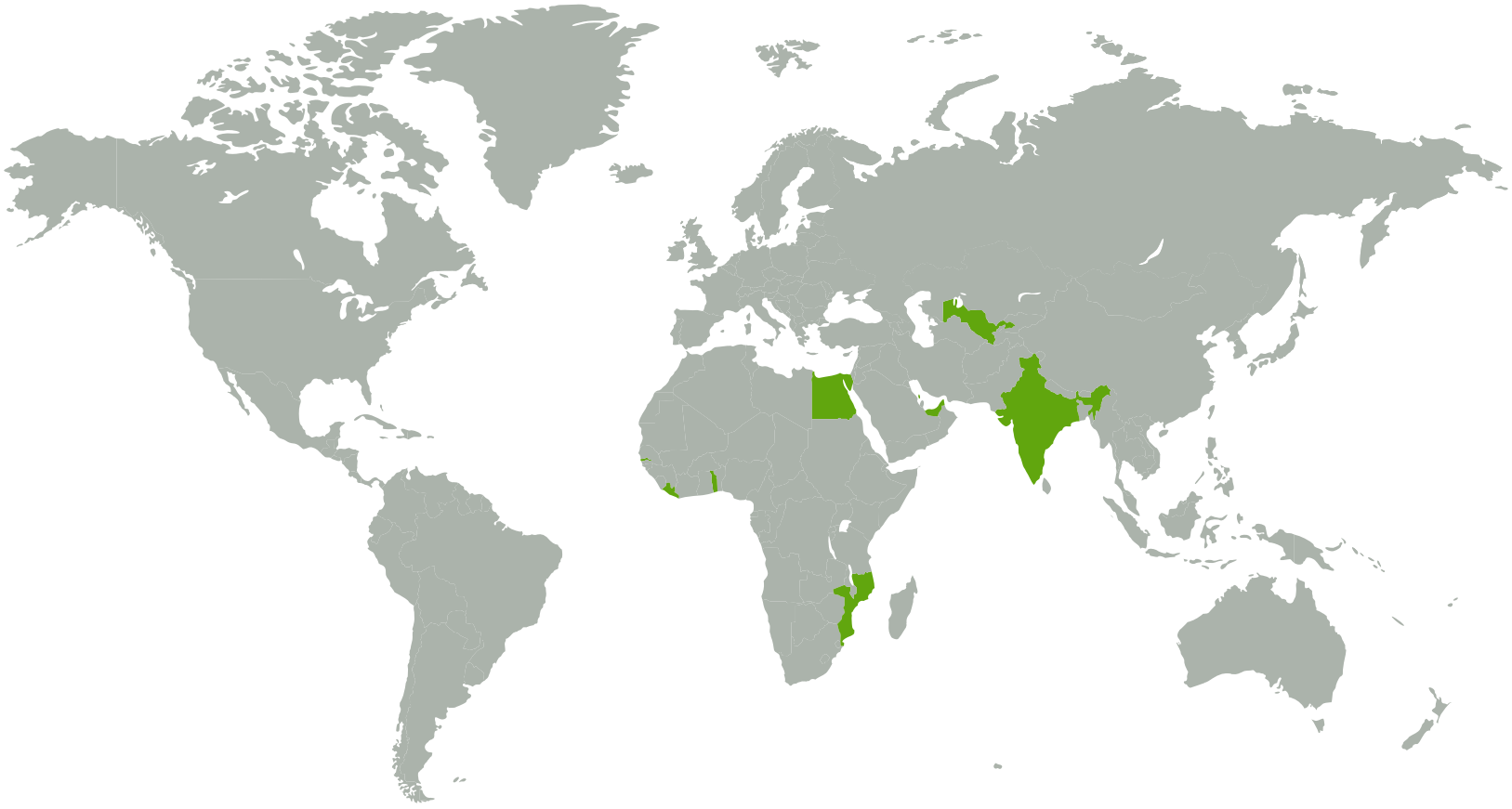
Scientists at ICBA conduct regular expeditions to different locations in the UAE to collect seeds of indigenous crops and wild plant species and store them in the center's genebank.

Sharing plant genetic resources

Under its mandate for marginal environments, ICBA collects, preserves and shares germplasm of plant species with proven or potential salinity, heat and drought tolerance.

ICBA provides seed samples to different institutions around the world for research, breeding and introduction.

In 2020 the center provided 217 seed samples belonging to 12 different crops to partner organizations and farmers in nine countries.



Partnerships are at the core of the Sustainable Development Goals.

Strengthen the means of implementation and revitalize the global partnership for sustainable development

Today the world faces a plethora of problems. From climate change to natural resource depletion, never in human history has the scale and complexity of the challenges been so immense. This means all countries must come and work together to tackle them.

The pandemic highlighted the importance of goodwill and cooperation among nations in the fight against common global threats.

National, regional and international organizations also must combine their efforts and support governments. Collaboration at every level is crucial for meeting the Sustainable Development Goals.

Joining forces for environmental protection in UAE

In 2020 ICBA and the Environment Agency - Abu Dhabi signed a new agreement aimed at enhancing sustainable environmental development and protection in the UAE.

In particular, the agreement spells out a number of areas of cooperation in ensuring the sustainable use of natural resources such as groundwater, soil and biodiversity in the country.

Dr. Shaikha Salem Al Dhaheri, Secretary General of the Environment Agency – Abu Dhabi, says: "We believe our success at EAD has always been a direct result of several collaborative efforts with important organizations and we are very pleased to sign this MoU with the International Center for Biosaline Agriculture with such a significant scope of work. We have a long-standing relationship with ICBA, and together we will be able to apply the larger framework for the conservation of the environment in Abu Dhabi through initiating projects that will safeguard the soil, groundwater, and biodiversity. Through this partnership, which will span three years, we will be able to develop studies of our natural habitats and lead research that will help us achieve our vision of protecting our nature, resources, and species."

Under the agreement, ICBA and the Environment Agency – Abu Dhabi will work on rangeland rehabilitation and management; data sharing; exchange of seeds and native plants; use of germplasm from ICBA's genebank; and research on drought-resistant species which could be potentially used for restoring some degraded habitats.

Moreover, the two organizations will cooperate in the use of remote-sensing and drone technologies for propagation and habitat monitoring; soil quality monitoring, assessment and mapping; applied research on hydroponics; and the use of reject brine from desalination units.

It is also expected that joint research will be conducted on developing native plant species adapted to dryland conditions for restoration programs; developing and updating water policies and strategies; and studying the impact of climate change on water resources.

ICBA and the Environment Agency – Abu Dhabi will collaborate on, among other things, using remote-sensing and drone technologies for propagation and habitat monitoring in the UAE.

ICBA manages a large collection of germplasm of drought-, heat- and salt-tolerant plant species from more than 150 countries and territories.

ICBA, Crop Trust partner for plant genetic resources conservation

In 2020 ICBA and the Global Crop Diversity Trust, also known as the Crop Trust, agreed to collaborate on enhancing the conservation of plant genetic resources for marginal environments.

A memorandum of understanding to this effect was signed between ICBA and the Crop Trust, a global organization that supports key international genebanks worldwide, including the Svalbard Global Seed Vault.

The collaboration focuses on raising funds for the Crop Trust's endowment mechanism to provide support for ICBA's genebank to reach performance standards and thus be eligible for long-term support to help conserve and use agrobiodiversity for sustainable agriculture and contribute to food security efforts in some of the world's most arid and saline regions.

Dr. Tarifa Alzaabi, Acting Director General of ICBA, says: *"We are excited about working with the Crop Trust to serve humanity. Not only will this collaboration help improve ICBA's genebank but will also contribute to safeguarding some of the world's most important plant genetic resources with proven or potential salinity, heat and drought tolerance as public goods. The partnership will ultimately support smallholder farmers and scientists in developing and introducing new climate-resilient and nutritious crop varieties in marginal environments."*

Under the agreement, ICBA and the Crop Trust will work together to mobilize financial support to build the capacity of ICBA's genebank to a level where it can be sustainably financed through the Crop Trust's endowment mechanism in perpetuity. The collaboration envisages upgrades and strategic actions such as carrying out a costing study, improving the quality management and documentation systems, conducting training, and setting up a performance monitoring system.

ICBA teams up with FAO elearning Academy

2020 saw the formalization of cooperation between ICBA and the FAO elearning Academy as the center became one of over 200 partners of the FAO elearning Academy, a dedicated platform offering courses that are fully aligned with the Agenda 2030 for Sustainable Development.

As a result, ICBA's stakeholders can benefit from over 350 multilingual courses provided free of charge as a global public good through the FAO elearning Academy.

Dr. Tarifa Alzaabi, Acting Director General of ICBA, says: "We are delighted to join the global network of the FAO elearning Academy's partners as capacity development forms an integral part of everything our center does. This partnership will help to reach a larger number of beneficiaries through our e-learning courses. It will also raise awareness about ICBA's work in such areas as sustainable use of natural resources, food security and agricultural development in marginal environments."

The two organizations have a shared goal and mission of developing human capital and strengthening capacities and skills in climate-smart agriculture and biodiversity conservation, among other things.

As the official certification body of the Food and Agriculture Organization of the United Nations, the FAO elearning Academy currently has a global audience of more than 600,000 learners and offers peer-reviewed content on different topics in a range of formats, including self-paced and blended learning programs, massive open online courses, technical webinars, online tutored courses, mobile learning courses, face-to-face training workshops, as well as master's and post-graduate programs.

The courses cover a wide range of subjects, including water management, soil restoration, climate-smart agriculture, gender empowerment, sustainable food systems, nutrition, food waste and food loss management, and responsible management of natural resources.

The collaboration is in line with ICBA's efforts to develop individual and institutional capacities in different countries.

نـزرع للغـد
ICBA
AGRICULTURE FOR TOMORROW

FAO elearning ACADEMY

The partnership makes it possible to extend the reach of ICBA's capacity development offerings.

The collaboration will focus on offering a range of programs tailored for university students, women and youth in different disciplines related to agriculture.

ICBA forms partnership with Dubai Entrepreneurship Academy

In 2020 ICBA inked a memorandum of understanding with the Dubai Entrepreneurship Academy to enhance individual capacities and create entrepreneurship opportunities for youth in the UAE in critical sectors like agriculture.

The academy will draw on its resources and experience as the educational arm of Dubai SME - the agency of Dubai Economy mandated to develop the small and medium enterprise sector - to develop various programs with the support of ICBA to improve the knowledge and skills of university students, women and youth in different disciplines related to agriculture and enable them to become successful entrepreneurs in this sector. Under the agreement, the two organizations will design educational programs and workshops to develop technical capabilities of scientists, experts and employees working in agriculture and related fields; create internship opportunities for university students; and undertake joint initiatives to encourage women and youth into agricultural entrepreneurship.

Ms. Ibtihal Al Naji, Director of the Dubai Entrepreneurship Academy, says: "The Dubai Entrepreneurship Academy is keen to establish partnerships that support the entrepreneurship development and growth in Dubai and the UAE. Through the MoU with the International Center for Biosaline Agriculture, we aim to provide high-level vocational training for entrepreneurs in agriculture, which is a sector critical to developing and diversifying the national economy. Thus, we will also be able to develop a new generation that understands the vital role of this sector in sustainable development. ICBA has unique experience and expertise in enhancing agricultural productivity in marginal and saline environments and hence, they can play a significant role in developing technical as well as administrative knowledge and skills related to agriculture among the groups targeted."

The partnership will facilitate ICBA's efforts on individual and institutional capacity development in the UAE in support of innovation-driven agricultural development and food security.


ICBA creates and shares knowledge that empowers smallholder farmers.

Knowledge sharing

One of the main outputs of ICBA's work is knowledge. The center is committed to generating and sharing this knowledge with all stakeholders from smallholder farmers to policymakers. ICBA disseminates science-based knowledge by means of capacity development, knowledge hubs and communications.


ICBA
AGRICULTURE FOR TOMORROW
United Arab Emirates
Soil Information System
نظام معلومات التربة
لدولة الإمارات العربية المتحدة
نزرع للغد
AGRICULTURE FOR TOMORROW
Give me agriculture and...
I will give you civilization

The Emirates Soil Museum has attracted over 7,000 visitors since its opening in 2016.

Emirates Soil Museum grows into a hub of education on sustainable development

Four years on, the Emirates Soil Museum has carved out a reputation for itself as a go-to place of learning about environmental protection and sustainable development in the UAE and beyond. Some 7,000 people, including ministers, policymakers, researchers, farmers and students from around the world have either visited the museum or participated in its programs since it was inaugurated in December 2016.

Despite the pandemic, the museum continued to engage its stakeholders through various online programs. As a result, it managed to attract more visitors and participants in 2020 than in 2019: 2,796 and 2,000 respectively. A total of 1,632 people took part in virtual activities while 1,164 joined in on-site tours and programs.

Throughout the year, the museum also collaborated with 32 organizations to hold and contribute to a range of online and in-person events highlighting the importance of soil and water resources for food security, sustainable agriculture and development.

Ms. Mai Shalaby, Curator of the Emirates Soil Museum, says: "We offer a wide range of learning programs for our visitors, but schoolchildren and students form the core part of our audience. Our goal is to raise their awareness about the importance of soils through interactive activities."

What is more, in collaboration with the World Soil Museum and other soil museums from different countries, the museum participated in the launch of the Global Soil Museum Network on World Soil Day, which is celebrated every year on 5 December.

The museum also partnered with the Water Alliance Association to support the Water Alliance Student Ambassadors in developing a children's story book on soil biodiversity. Written, illustrated and designed by children, it is the first children's book co-produced by the museum.

The museum was also featured in a major study titled "A review of the world's soil museums and exhibitions", which was published in Advances in Agronomy. The museum is a unique facility in the Gulf region. It serves as a knowledge hub for everyone who is interested in soil conservation in the UAE and the region. It is specially designed to raise awareness, particularly among youth, about the threats to soils and the significant role healthy soils play in meeting the current and future food needs worldwide.

Harnessing the power of online learning

With an increased focus on online learning globally in the wake of the pandemic, ICBA also began reaching a more diverse group of stakeholders in 2020 with its capacity development and knowledge-sharing programs and activities using different tools and platforms.

Not only did the center increase the number of its offerings but it also diversified the range with special attention to youth and women. It continued equipping farmers, extension specialists, researchers and young people, among others, with the skills, resources and tools to innovate and tackle the challenges facing agriculture and food production in marginal environments.

In particular, the center worked to provide venues for education and collaboration through programs like the Arab Women Leaders in Agriculture and the ICBA Youth Engagement Society to foster the skill and creativity of women and youth to generate novel solutions for sustainable development and food security.

To this end, ICBA launched the Virtual Alumnae Association of the Arab Women Leaders in Agriculture fellowship program to connect fellows and facilitate their cooperation with one another and their peers from the Middle East and North Africa.

What is more, the center rolled out the Live with ICBA – a new series of online events and activities dedicated to capacity development and knowledge dissemination. Under the initiative, the center organized a number of live streams by scientists to showcase and promote various best practices, solutions and technologies for farming under unfavorable environmental conditions. Dr. Charbel Tarraf, Senior Manager - Corporate Services and Development at ICBA, says: "The pandemic presented an opportunity to create new programs and adapt existing ones for online learning. This, in turn, helped us to cater for a larger number of beneficiaries around the world. And we intend to expand the range and quantity of our virtual and e-learning offerings as we see a growing demand for such products among our stakeholders."

ICBA also built various partnerships and collaborated with other organizations to conduct a variety of capacity development events.

As a result of capacity development work in 2020, 154 participants from different countries benefitted from in-person and online technical training courses. The center also trained 40 interns from universities in the UAE and abroad and offered four post-doctoral fellowships. This work builds on two decades of efforts aimed at helping farmers and other stakeholders acquire necessary skills, resources and tools for sustainable agriculture and development, as well as research and innovation.

Since 2000, ICBA has provided around 24 post-doctoral fellowships and some 160 internships. And 2,676 people have taken part in specialized technical training programs.

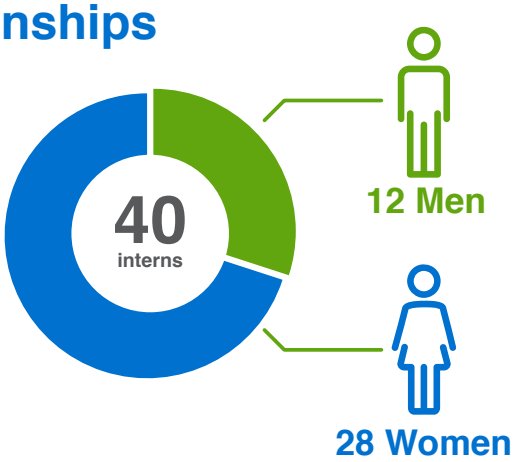
ICBA launched new capacity development and knowledge-sharing initiatives in 2020.

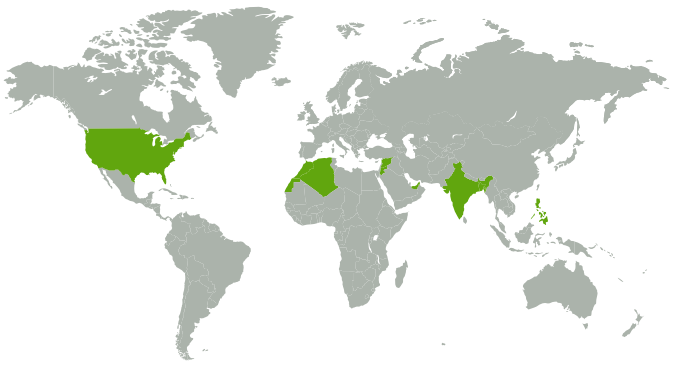
Developing capacities

Capacity development is an integral part of ICBA's work. In 2020 the center focused considerable efforts and resources on catering to the capacity development needs of different stakeholders.

ICBA continued to work on enhancing the capacities of institutions, researchers, students and farmers through short- and medium-term training courses, workshops, farmer field schools, internships, master's, doctoral and post-doctoral research programs.

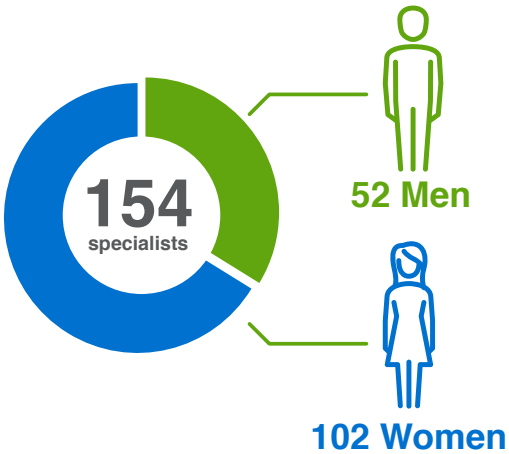
Internships





University students from nine countries

Technical training courses



Five special technical training courses, online and in-person, for participants from 14 countries

Communicating science-based knowledge

ICBA continued to communicate its science-based knowledge and research and development work to different audiences through the news media, its website and social media channels.

201
media mentions

187,570
website sessions

253,305
YouTube views

Knowledge products

Science-based publications form the core of ICBA's knowledge output. They are part of the center's contribution to the advancement of agricultural science. In 2020 our scientists produced a total of 53 research publications.

Peer-reviewed journals

Published

Ahmadzai, H. (2020). Trends in Quinoa Adoption in Marginal Areas, Economic Viability, and Policy Outlook. Journal of Agribusiness and Rural Development, 3 (57), pp. 235-247. doi: *https://doi.org/10.17306/J.JARD.2020.01351*

Ashenafi, W. D., **Qureshi, A. S.** & Senbeta, B. M. (2020). Evaluation of some Sesbania genotypes for their salt tolerance, biomass yield, nutrient composition, and soil ameliorative response. Asian Journal of Plant Science, 19, pp. 300-312. doi: 10.3923/ajps.2020.300.312 (IF: 0.51)

Ashokkumar, S., Jaganathan, D., Ramanathan, V., **Rahman, H.**, Palaniswamy, R., Kambale, R., et al. (2020). Creation of novel alleles of fragrance gene OsBADH2 in rice through CRISPR/Cas9 mediated gene editing. PLoS ONE, 15 (8): e0237018. doi: https://doi.org/10.1371/journal.pone.0237018

Bannari, A., Hameid M. M. N., Abuelgasim, A. & **El-Battay, A.** (2020). Sentinel-MSI and Landsat-OLI Data Quality Characterization for High Temporal Frequency Monitoring of Soil Salinity Dynamic in an Arid Landscape. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 13, pp. 2434-2450. doi: 10.1109/JSTARS.2020.2995543 (IF: 3.82)

Ben Azaiez, F. E., Ayadi, S., Capasso, G., Landi, S., Paradisone, V., Jallouli, S., **Hammami, Z.**, Chamekh, Z., Zouari, I., Trifa, Y. & Esposito, S. (2020). Salt Stress Induces Differentiated Nitrogen Uptake and Antioxidant Responses in Two Contrasting Barley Landraces from MENA Region. Agronomy, 10, p. 1426. doi: 10.3390/agronomy10091426

Fanourakis, D., Aliniaeifard, S., Sellin, A., **Giday, H.**, Körner, O., Rezaei Nejad, A., Delis, C., Bouranis, D., Koubouris, G., Kambourakis, E., Nikoloudakis, N. & Tsaniklidis, G. (2020). Stomatal behavior following mid- or long-term exposure to high relative air humidity: a review. Plant Physiology and Biochemistry, 153, pp. 92-105. doi: https://doi.org/10.1016/j.plaphy.2020.05.024.

Hachem, M., Sharma, B. K., **El-Naggar, A.**, Pilankar, I. & Anwar, N. (2020). Systematic Approaches for Soil Analysis in Forensic Investigation. 2020 Advances in Science and Engineering Technology International Conferences (ASET).

Hammami, Z., Ahmed, N., Ben Hmida, N., Touns, I. S., Ayadi, S. & Trifa, Y. (2020). The Arsenal of Morphological and Physiological Mechanisms Adopted by Barley (Hordeum vulgare L.) to Face Salt Stress Damage. Acta Scientific Agriculture.

Hammami, Z., Qureshi, A. S., Sahli, A., Gauffreteau, A., Chamekh, Z., Fatma, E. B., Sawsen, A. & Trifa, Y. (2020). Modelling the effects of irrigation water salinity on growth, yield and water productivity of barley in three contrasted environments. Agronomy, 10, p. 1459. doi: 10.3390/agronomy10101459

Hussain, M. I. & **Qureshi, A. S.** (2020). Health risks of heavy metal exposure and microbial contamination through consumption of vegetables irrigated with treated wastewater at Dubai, UAE. Environmental Science and Pollution Research. doi: https://doi.org/10.1007/s11356-019-07522-8 (IF: 3.056)

Khaitov, B., Karimov, A., Abdiev, A., Farrukh, J. & Park, K. (2020). Beneficial effect of Rhizobium inoculation on growth and yield of chickpea (Cicer arietinum L.) in saline soils. Bulgarian Journal of Agricultural Science, 26 (1), pp. 96-104. (IF: 0.6)

Krishna, V. V., Yigezu, Y. A., **Karimov, A. A.** & Erenstein, O. (2020). Assessing technological change in agri-food systems of the Global South: A review of adoption impact studies in wheat. Outlook on Agriculture. (IF: 0.960)

Misra, G., Badoni, S., Parween, S., **Singh, R. K.,** Leung, H., Ladejobi, O., Mott, R. & Sreenivasulu, N. (2020). Genome-wide association coupled gene to gene interaction studies unveil novel epistatic targets among major effect loci impacting rice grain chalkiness. Plant Biotechnology Journal. doi: https://doi.org/10.1111/pbi.13516 (IF: 8.154)

Pabuayon, I. C. M., Kitazumi, A., Gregorio, G. B., **Singh, R. K.** & de los Reyes, B. G. (2020). Contributions of Adaptive Plant Architecture to Transgressive Salinity Tolerance in Recombinant Inbred Lines of Rice: Molecular Mechanisms Based on Transcriptional Networks. Frontiers in Genetics. doi: 10.3389/fgene.2020.594569 (IF: 3.789)

Qasem Ahmad, H., Kamaruddin, S. A., Mahmood Agha, O. M. A., Harun, S. B. & **Zaaboul, R.** (2020). A Review of Meteorological Drought Based Indices Towards Integrated Water Resources Management in Iraq. Journal of Computational and Theoretical Nanoscience. (IF: 0.22)

Qureshi, A. S. (2020). Challenges and Prospects of Using Treated Wastewater to Manage Water Scarcity Crises in the Gulf Cooperation Council (GCC) Countries. Water, 12 (7), p. 1971. doi: https://doi.org/10.3390/w12071971 (IF: 2.544)

Qureshi, A.S. (2020). Groundwater governance in Pakistan: From colossal development to neglected management. Water, 12, p. 3017. doi: 10.3390/w12113017 (IF: 2.544)

Qureshi, A. S. & Ashenafi, W. D. (2020). Evaluating growth and yield parameters of five quinoa (Chenopodium quinoa W.) genotypes under different salt stress conditions. Journal of Agricultural Science, 12 (3). doi:10.5539/jas.v12n3p128 (IF: 2.28)

Qureshi, A. S. & Ashenafi, W. D. (2020). Differential analysis of five quinoa (Chenopodium quinoa W.) genotypes under different salt stresses in a controlled environment. American-Eurasian Journal of Sustainable Agriculture, 14 (1). pp. 14-21. doi: 10.22587/aejsa.2020.14.1.2 (IF: 0.71)

Rezzouk, F. Z., **Shahid, M., Elouafi, I. A.**, Zhou, B., Araus, J. L. & Serreta, M. D. (2020). Agronomic performance of irrigated quinoa in desert areas: Comparing different approaches for early assessment of salinity stress. Agricultural Water Management, 240. doi: https://doi.org/10.1016/j.agwat.2020.106205

Rodríguez, J. P., **Rahman, H.**, **Thushar, S.** & **Singh, R. K.** (2020). Healthy and Resilient Cereals and Pseudo-Cereals for Marginal Agriculture: Molecular Advances for Improving Nutrient Bioavailability. Frontiers in Genetics, 11 (49). doi: https://doi.org/10.3389/fgene.2020.00049

Saade S., Brien, C., Pailles, Y., Berger, B., **Shahid, M.**, Russell, J., Waugh, R., Negrão, S. & Tester, M. (2020). Dissecting new genetic components of salinity tolerance in two-row spring barley at the vegetative and reproductive stages. PLoS ONE, 15 (7):e0236037. doi: https://doi.org/10.1371/journal.pone.0236037

Satturu., V, Vattikuti, J. L., Sai, J. D., Kumar, A., **Singh, R. K.**, Prasad M. S., Zaw, H., Jubay, M. L., Satish, L., Rathore, A., Mulinti, S., Lakshmi, V. G. A., Chakraborty, A. & Thirunavukkarasu, N. (2020). Multiple Genome-Wide Association Mapping Models Identify Quantitative Trait Nucleotides for Brown Planthopper (Nilaparvata lugens) Resistance in MAGIC Indica Population of Rice. Vaccines, 8, p. 608. doi:10.3390/vaccines8040608 (IF: 3.143)

Scott, M. F., Ladejobi, O., Amer, S., Bentley, A. R., Biernaskie, J., Boden, S. A., Clark, M., Dell'Acqua, M., Dixon, L. E., Filippi, C. V., Fradgley, N., Gardner, K. A., Mackay, I. J., O'Sullivan, D., Percival-Alwyn, L., Roorkiwal, M., **Singh, R. K.**, Thudi, M., Varshney, R. K. & Mott, R. (2020). Multi-parent populations in crops: A toolbox integrating genomics and genetic mapping with breeding. Heredity. doi: https://doi.org/10.1038/s41437-020-0336-6

Thant, A. A., Teutscherova, N., Vazquez, E., Kalousova, M., Phyo, A., **Singh, R. K.** & Lojka, B. (2020). On-farm rice diversity and farmers' preferences for varietal attributes in Ayeyarwady Delta, Myanmar. Journal of Crop Improvement. doi: 10.1080/15427528.2020.1746457 (IF: 0.87)

Zewail, R. M. Y., El-Gmal, I. S., **Khaitov, B.** & El-Desouky H. S. A. (2020). Micronutrients through foliar application enhance growth, yield and quality of sugar beet (Beta vulgaris L.). Journal of Plant Nutrition. doi: https://doi.org/10.1080/01904167.2020.1771580 (IF: 0.86)

Accepted

Alandia, G., **Rodriguez, J. P.**, Jacobsen, S. E., Bazile, D. & Condori, B. (2020). A new face of quinoa production: challenges for the Andean region. Global Food Security. (In press)

Allanov, Kh., Shamsiev, A., Durdiev, N., Avliyakulov, M., Karimov, A. & Khaitov, B. (2020). Improving nutrition and water use efficiencies of pima cotton varieties under arid conditions of Uzbekistan. Journal of Plant Nutrition. (In press) (IF=0.86)

Christiansen, A., **Lyra, D. A.** & Jørgensen, H. (2020). Increasing the value of Salicornia bigelovii green biomass grown in a desert environment through bio-fractionation. Industrial Crops and Products. (In press) (IF: 4.450)

Khaitov, B., Karimov, A., Toderich, K., Sultanova, Z., Mamadrahimov, A. & Allanov, K. (2020). Adaptation, grain yield and nutritional characteristics of quinoa (Chenopodium quinoa) genotypes in marginal environments of the Aral Sea basin. Journal of Plant Nutrition. (In press) (IF: 1.35)

Makkawi, Y., El Sayed, Y., **Lyra, D. A.**, Hassan Pour, F., Khan, M. & Badrelzama, M. (2020). Assessment of the pyrolysis products from halophyte Salicornia bigelovii cultivated in a desert environment. Fuel. (In press) (IF: 5.128)

Qureshi, A. S. (2020). Challenges and opportunities of using treated wastewater to address water scarcity crises in the Gulf Cooperation Council (GCC) countries. Water. (In press) (IF: 2.544)

Shekhawat, K., Saad, M. M., Sheikh, A., Mariappan, K., **Al-Mahmoudi, H.**, Abdulhakim, F., Eida, A. A., Jalal, R., Masmoudi, K. & Hirt, H. (2020). Root endophyte induces plant thermotolerance by constitutive chromatin modification at heat stress memory gene loci. EMBO Reports. (In press) (IF: 9.96)

Toderich, K., Mamadrahimov, A., **Khaitov, B., Karimov, A.**, Soliev, A., Kameswara Rao, N. & Shuyskaya, N. (2020). Differential impact of salinity stress on seed minerals, storage proteins, fatty acids and squalene composition of a new quinoa genotype, grown in hyper-arid desert environments. Frontiers in Plant Science. (In press) (IF: 4.402)

Submitted

Affandi, F. Y., Prayoga, T., Ouzounis, T., **Giday, H.**, Verdonk, C. J., Woltering, E. J. & Schouten, R. E. Additional blue light during cultivation induces cold tolerance in tomato fruit, but only to an optimum. LWT - Food Science and Technology.

Ben Amara, H., Bouadila, S., **Fatnassi, H.**, Arici, M. & Guizani, A. Climate assessment of greenhouse equipped with south-oriented PV roofs: An experimental and computational fluid dynamics study. Sustainable Energy Technologies and Assessments.

Karimov, A. Kh., Toshev, R. H., Karshiev, R., Karimov, A. & Boirov, R. Water, Energy and Food Nexus in Lift Irrigation Schemes of Central Asia. Renewable and Sustainable Energy Reviews. (IF: 12.11)

Khaitov, B., Karimov, A. A., Toderich, K., Sultanova, Z., Mamadrahimov, A. & Allanov, K. Adaptation potential, grain yield and nutritional characteristics of quinoa (Chenopodium quinoa) genotypes in marginal environments of the Aral Sea basin. Journal of Plant Nutrition. (IF: 0.86)

Nefissi Ouertani, R., Abid, G., Karmous, C., Ben Chikha, M., Boudaya, O., **Mahmoudi, H.**, Mejri, S. & Ghorbel, A. Evaluating contribution of antioxidant metabolism-related genes, proline and soluble sugars contents on growth of two contrasting barley genotypes under salt stress. The Journal of Agronomy.

Rafik, S., Choukr-Allah, R., El Gharouss, M., **Rodriguez, J. P.**, Filali, K. & Hirich, A. Techno-economic assessment of quinoa production and transformation in Morocco. Environmental Science and Pollution Research.

Ruane, C. A., Vautard, R., Ranasinghe, R., Sillmann, J., Coppola, E., Arnell, N., Bojariu, R., Abigail Cruz, F., Dessai, S., Saiful Islam, A., Iles, C., Rahimi, M., Ruiz Carrascal, D., Bamba Sylla, M., Tebaldi, C., Wang, W. & **Zaaboul, R.** The Climatic Impact-Driver Framework for the Assessment of Sector-relevant Regional Climate Information. Nature Climate Change. (IF: 20.893)

Zittis, G., Hadjinicolaou, P., Almazroui, M., Bucchignani, E., Driouech, F., El Rhaz, K., Kurnaz, L., Nikulin, G., Ntoumos, A., Ozturk, T., Proestos, Y., Stenchikov, G., Zaaboul, R. & Lelieveld, J. Business-as-usual will lead to ultra-extreme heatwaves in the Middle East and North Africa. Climate and Atmospheric Science. (IF: 5.36)

Book chapters

Published

Alandia, G., Odone, A., **Rodriguez, J. P.**, Bazile, D. & Condori, B. (2020). Quinoa – evolution and future perspectives. In: Schmöckel, S. & Kole, C. (eds). Compendium of Plant Genomes: Quinoa. Springer.

Alandia, G., **Rodriguez, J. P.**, Condori, B., Palmgren, M. B. & Lopez-Marquez, R. L. (2020). Advances of Biotechnology in Quinoa Production – A global perspective. In: Var., A. & Jane, A. (eds). Biology and Biotechnology of Quinoa. Springer.

Aweke, M. G. & **Qureshi, A. S.** (2020). Tef (Eragrostis tef): A Superfood Grain from Ethiopia with Great Potential as an Alternative Crop for Marginal Environments. In: Hirich, A., Choukr-Allah, R. & Ragab, R. (eds.). Emerging Research in Alternative Crops under Marginal Environment. Springer. doi: 10.1007/978-3-319-90472-6

Gill, S., Alshankiti, A., Shahid, S. A. & **Rodriguez, J. P.** (2020). Amending soil health to improve productivity of alternate crops in marginal sandy soils of United Arab Emirates. In: Hirich, A., Choukr-Allah, R & Ragab, R. (eds.). Emerging Research in Alternative Crops under Marginal Environment. Springer. doi: 10.1007/978-3-319-90472-6

Lyra, D. A., Ismail, S. & Brown, J. J. (2020). Crop Potential of Six Salicornia bigelovii Populations Under Two Salinity Water Treatments Cultivated in a Desert Environment: A Field Study. In: Hirich, A., Choukr-Allah, R. & Ragab, R. (eds). Emerging Research in Alternative Crops. Environment & Policy, 58. Springer, Cham. doi: https://doi.org/10.1007/978-3-319-90472-6_14

Rodriguez, J. P., Andreasen, C., Sørensen, M. & Jacobsen., S. E. (2020). Cañihua (Chenopodium pallidicaule) – a promising new crop for arid areas. In: Hirich, A., Choukr-Allah, R. & Ragab, R. (eds.). Emerging Research in Alternative Crops under Marginal Environment. Springer. doi: 10.1007/978-3-319-90472-6

Rodriguez, J. P., Ono, E., Al Mousa's, S. A., Choukr-Allah, R. & Hirich, A. (2020). Cultivation of quinoa (Chenopodium quinoa) in desert ecoregion. In: Hirich, A., Choukr-Allah, R. & Ragab, R. (eds.). Emerging Research in Alternative Crops under Marginal Environment. Springer. doi: 10.1007/978-3-319-90472-6

Shahid, M., Jaradat, A. & Rao, N. K. (2020). Safflower: a multipurpose crop for the marginal lands. In: Hirich, A., Choukr-Allah, R. & Ragab, R. (eds.). Emerging Research in Alternative Crops under Marginal Environment. Springer. doi: 10.1007/978-3-319-90472-6

Elouafi, I., **Shahid, M., Begmuratov, A.** & Hirich, A. (2020). The contribution of alternative crops to food security in marginal environments. In: A. Hirich et al. (eds.). Emerging Research in Alternative Crops. Environment & Policy, 58. Springer, Cham. doi: https://doi.org/10.1007/978-3-319-90472-6_1

Accepted

Lyra, D., et al. From Desert Farm to Fork: Value chain development for innovative Salicornia-based food products – A case study in the United Arab Emirates. In: Saline futures: state-of-the-art in saline agriculture. Routledge Taylor & Francis Group.

Shahid, M. Response of Quinoa to High Salinity Under Arid Conditions. In: Saline futures: state-of-the-art in saline agriculture. Routledge Taylor & Francis Group.

Supporters and contributors

ICBA's progress on improving food security and nutrition and creating employment opportunities for vulnerable rural communities in different countries is possible thanks to unwavering support of the many donor and development agencies and partner organizations we work with.

Most of the funding comes from ICBA's founders: the Government of the UAE and the Islamic Development Bank. This funding helps ICBA continue to deliver on its mission and vision.

In 2020 our research and development work was also funded by other supporters and contributors. We would like to thank all of them for their generous contributions.

- Abu Dhabi Agriculture and Food Safety Authority
- Al Batha Group
- American University of Sharjah
- Arab-German Young Academy of Sciences and Humanities
- Bill & Melinda Gates Foundation
- Council for Australian-Arab Relations
- Desert Control
- EXPO Dubai 2020
- Falcon Eye Drones
- Food and Agriculture Organization of the United Nations
- Green Plus Co. Ltd.
- Hydrorock International
- HSBC Bank Middle East Limited
- International Development Research Center
- International Fund for Agricultural Development
- International Maize and Wheat Improvement Center
- Institute of International Education
- Khalifa Fund for Enterprise Development
- Mercy Corps
- Ministry of Energy and Infrastructure of the UAE
- OCP Foundation
- OPEC Fund for International Development
- Raincatcher Plus LLC
- Sergey Brin Family Foundation

Financials

Statement of financial position

	As at 31 December	
	2020	2019
	USD'000	USD'000
ASSETS		
Non-current assets		
Property and equipment	3,839	4,066
Right of use assets	59	98
	3,898	4,164
Current assets		
Inventories	53	56
Accounts receivables	831	954
Short-term deposits	13,620	13,620
Cash and cash equivalents	7,238	9,095
	21,742	23,725
Total assets	**25,640**	**27,889**
EQUITY AND LIABILITIES		
Equity		
Reserves – Designated	15,397	15,397
Reserves – Undesignated	3,877	2,762
Total equity	**19,274**	**18,159**
LIABILITIES		
Non-current liabilities		
Lease liability	26	64
Provision for employees' end of service benefits	587	484
	613	548
Current liabilities		
Lease liability	38	39
Accounts payables	3,141	6,423
Deferred income – restricted	2,574	2,720
	5,753	9,182
Total liabilities	**6,366**	**9,730**
Total equity and liabilities	**25,640**	**27,889**

Statement of activities and other comprehensive income

	Year ended 31 December	
	2019	2018
	USD'000	USD'000
Grants income	8,999	10,929
Other income	21	34
Research and collaborator expenses	(6,004)	(8,750)
General and administration expenses	(2,169)	(2,464)
Operating (deficit)/surplus for the year	847	(251)
Finance income - net	268	337
Surplus for the year	1,115	86
Other comprehensive income	-	-
Total comprehensive income for the year	1,115	86

Board of directors

H.E. Razan Khalifa Al Mubarak
Managing Director, Environment Agency - Abu Dhabi (Chair)

Dr. Abdelouahhab Zaid
Agricultural Advisor, Ministry of Presidential Affairs of the United Arab Emirates

Mr. Essa AbdulRahman Al Hashemi
Head, Food Security Office, Office of the Prime Minister of the United Arab Emirates

Dr. Kanayo F. Nwanze
Fifth President, International Fund for Agricultural Development

H.E. Mohammed Saif Al Suwaidi
Director General, Abu Dhabi Fund for Development

Mr. Mohammad Jamal Alsaati
Director, Office of the President of the Islamic Development Bank Group

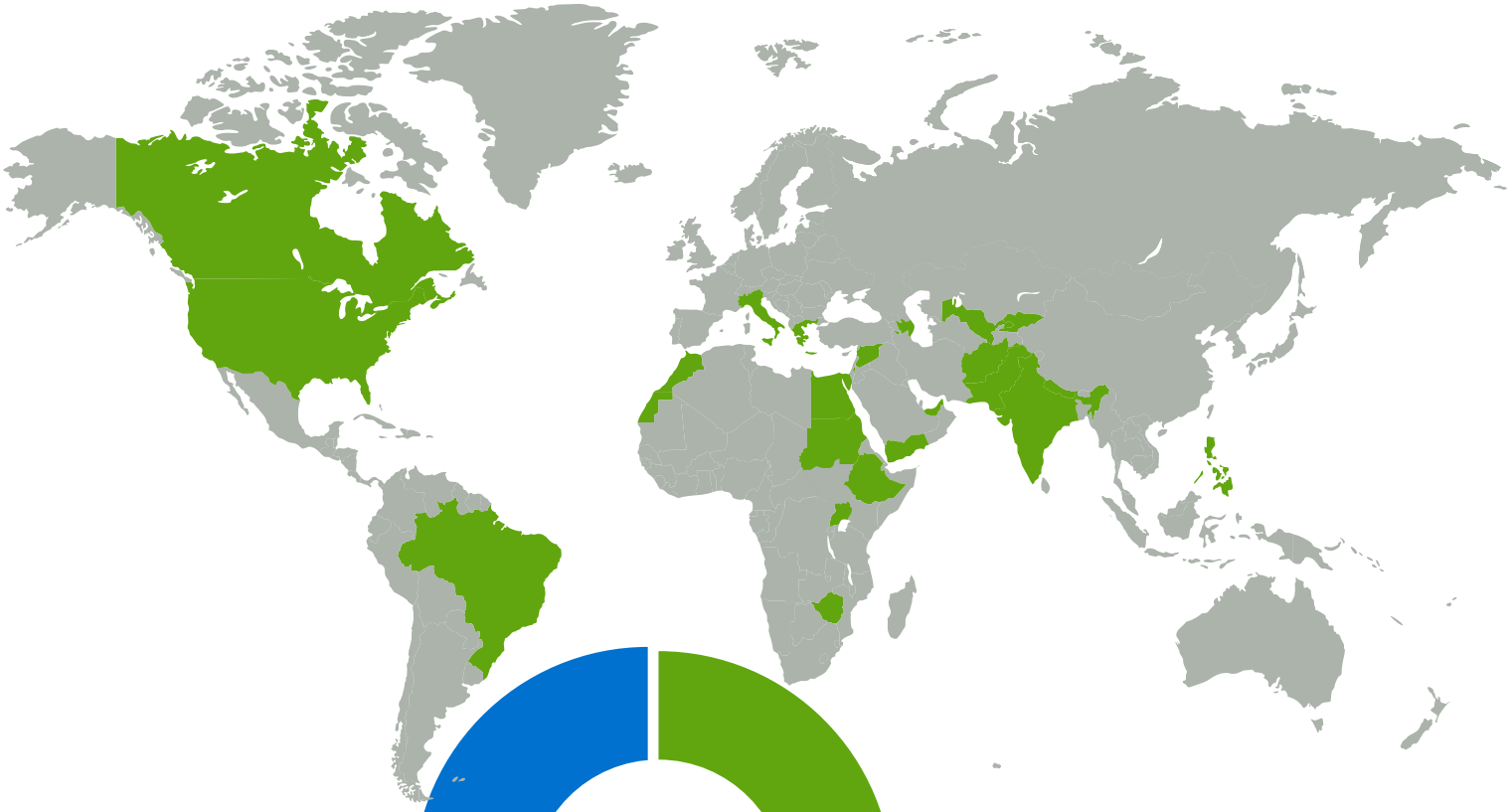
Dr. Ren Wang
Senior Vice President of BGI Group

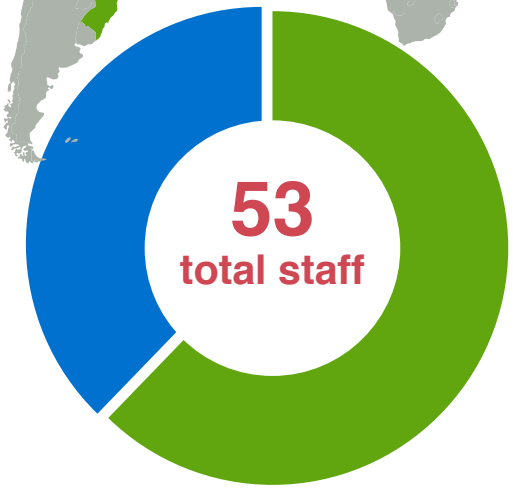
Dr. Ursula Schaefer-Preuss
Vice President, UN Women Germany

Prof. R. Quentin Grafton
Chairholder, UNESCO Chair in Water Economics and Transboundary Water Governance

Dr. Tarifa Alzaabi
Acting Director General, ICBA (Ex officio member)

Staff





ICBA staff are from

24

countries around the world

20
women

33
men

نـزرع للغـد
ICBA
AGRICULTURE FOR TOMORROW

INTERNATIONAL CENTER FOR BIOSALINE AGRICULTURE

Agriculture for tomorrow

ICBA Headquarters
Al Ruwayyah 2, Academic City
P.O. Box 14660, Dubai
United Arab Emirates
Email: icba@biosaline.org.ae
Phone: +971 4 304 63 00

ICBA Central Asia and South Caucasus
6 Osiyo Street, P.O. Box 4375
Tashkent, 100083
Uzbekistan
Email: a.karimov@biosaline.org.ae
Phone: +998 71 237 21 69

www.biosaline.org

ICBAAgriculture

Proudly supported by:

IsDB Islamic Development Bank
هيئة البيئة - أبوظبي Environment Agency - ABU DHABI
UNITED ARAB EMIRATES MINISTRY OF CLIMATE CHANGE & ENVIRONMENT
الإمارات العربية المتحدة وزارة التغير المناخي والبيئة