



A Year in Focus: Impact Report

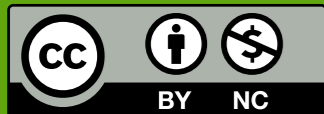
2019

A Year in Focus: Impact Report 2019

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H.E. Mariam bint Mohammed Almheiri
Minister of State for Food Security of the UAE

Message from the Minister of State for Food Security of the UAE

Global food systems are under unprecedented pressure. By 2050, the world's food production and supply networks will need to sustainably feed more than 9 billion people, meaning they will have to produce food to meet demand that will be 60% greater than it is today. Added to this challenge are the impacts of climate change, including increasing desertification and droughts, making it harder than ever to grow conventional crops that require plentiful supplies of fresh water.

There has never been a more pressing need for the global community to find new and effective ways to produce food. The International Center for Biosaline Agriculture (ICBA) is leading efforts in this direction through its advanced research into plants that have both a food value and which not only tolerate, but thrive, in marginal environments where conditions are too harsh to support established staple crops.

In addition to its extensive research agenda of identifying, testing and piloting resource-efficient, climate-smart crops and technologies, ICBA pioneers international cooperation efforts in finding solutions for salt-affected, water-scarce and drought-vulnerable regions. The center hosted the Global Forum on Innovations for Marginal Environments, which took place in Dubai in November 2019, sending a strong message on the importance of forming international partnerships to find ways of ending global hunger through innovative methods.

ICBA is uniquely positioned to introduce much-needed climate-smart crops and technologies in different parts of the world, thereby helping to alleviate existing food and water crises and prevent their future occurrence. Committed to building human capacity both in the UAE and abroad, ICBA runs extensive skills development and training

programmes that to date have enhanced the knowledge and expertise of more than 1,650 participants from 70 countries.

Through its array of research activities and initiatives centered on creating a resilient and sustainable food system, ICBA is proving instrumental in enhancing the UAE's food security agenda, as well as meeting national and international efforts towards the United Nations' second Sustainable Development Goal – Zero Hunger by 2030. It is an indispensable part of the UAE's extensive food security landscape and I wish its dedicated team every success in the years ahead.



H.E. Dr. Bandar M. H. Hajjar
President of the Islamic Development Bank Group

Message from the President of the Islamic Development Bank Group

It is with great pleasure that I write this message for the 2019 edition of ICBA's impact report. Twenty years ago the Islamic Development Bank and the UAE Government had the foresight to lay the center's foundations. The scale and the range of the current global challenges show how forward-looking that decision was. Originally mandated to tackle soil and water salinization, ICBA has grown into a world-class institution dealing with a broad set of problems in marginal environments – from climate change to natural resource degradation to water scarcity.

Today the world faces a climate crisis and its impacts are likely to be more severe in nations with high levels of water stress – a problem that many of our member countries with agriculture-dependent economies have to contend with. So there is a pressing need for the solutions that ICBA has developed over the past two decades. But it is also necessary to continue developing new ones under a changing climate. And as an applied research center, ICBA has a special role in this endeavor.

The center has already made considerable progress in adapting, testing and introducing alternative crops and technologies in many countries and building the capacities of various stakeholders, including smallholder farmers, specialists, scientists and policymakers.

I am glad to note ICBA's significant achievements in this regard in 2019 too. Thousands of stakeholders from 39 countries, including 33 of our member states, benefitted directly and indirectly from the center's research-for-development and capacity-building projects. These efforts were well aligned with both our bank's mission and the Sustainable Development Goals.

The center did a great job of helping at-risk rural communities to produce food to eat and sell in unfavorable environmental conditions by adopting climate-smart plants and practices. As a result, more and more smallholder farmers in sub-Saharan Africa and North Africa cultivate forage and food crops like sorghum and quinoa, among others. It is also good to see that ICBA is creating and strengthening value chains for these crops. A case in point is the center's work on the local value chains for quinoa in Morocco.

ICBA also achieved positive results under several projects to improve water use and management at the local, national and regional levels. For example, solar-powered small-scale irrigation systems make it possible for rural communities to transport water to their fields in four sub-Saharan African countries. The center also succeeded in facilitating better dialogue and coordination among Iraq, Syria and Turkey on transboundary water

management in the Euphrates-Tigris River Basin.

It is also worth mentioning ICBA's efforts to transfer knowledge and technology. The center organized 11 special technical training courses for 218 participants, including 105 women, from 28 countries. And our bank provided funding for five of them in Benin, Kyrgyzstan, Nigeria, Pakistan and the UAE, which attracted 108 specialists.

Lastly, I would like to congratulate ICBA's management and staff on organizing a series of successful events to celebrate and showcase the center's work over the years, one of which I was pleased to attend in early March 2019. Our bank was also happy to support the Global Forum on Innovations for Marginal Environments which brought together nearly 300 delegates from more than 40 countries in late November 2019. Looking back on ICBA's remarkable work over the years, we take pride in being part of its success story. And we remain committed to continuing our support for the center in its mission to ensure food, water and income security in marginal environments.

I would like to thank the center's Board of Directors, management and staff for their dedication and hard work to continue this success story.



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



Dr. Ismahane Elouafi
Director General

Foreword from the Board Chair and the Director General

2019 marked a significant milestone in ICBA's history. Twenty years ago the Government of the UAE and the Islamic Development Bank took a visionary decision to establish the center as a response to the challenges of salinization and water scarcity facing agriculture in different regions.

With hindsight it is clear that the vision that laid the center's foundations back then was prescient. Two decades on, the challenges that ICBA was originally tasked with finding solutions to have only grown in scale and range.

Today the world is going through a climate emergency, the population is growing, and the natural resources are declining. So ICBA's mission to fight poverty and food insecurity in marginal environments, where the majority of the vulnerable populations live, is more relevant and necessary than ever before.

The commitment and support over the years of ICBA's founders, as well as many national, regional and international organizations, have helped the center to make considerable progress in this mission. It has evolved into a world-class institution in the vanguard of research and development on alternative crops and technologies suited to a changing climate. Tens of thousands of smallholder farmers, specialists, scientists and policymakers in over 30 countries have benefitted from ICBA's knowhow which makes it possible to sustainably produce food in unfavorable conditions, save scarce natural resources and protect the environment.

And last year was no different. The center implemented 55 SDG-aligned projects and programs focused on technology and knowledge transfer, targeting different 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 smallholders cope with salinization in Egypt, Ethiopia, Morocco and other countries, scientists continued to introduce salt-tolerant food and forage crops. In Ethiopia, for example, 15 genotypes from ICBA were registered as varieties following trials and eight seed-units were established across the country to produce and distribute the seeds among small-scale farmers.

Under ICBA's quinoa program, scientists continued advanced research to breed better genotypes, promote quinoa cultivation among rural communities and strengthen local value chains as a way to improve food security, nutrition and livelihoods. To fast-track the development of genotypes adapted to specific agro-ecosystems, ICBA began genome-wide association studies to pinpoint genes responsible for quinoa's certain traits. Scientists also worked to enhance water use and management at the local, national and regional levels. A multi-stakeholder project in Jordan introduced water-saving technologies to help farmers to cut down on water and energy consumption. In Burkina Faso, Mali, Niger and Senegal, solar-powered irrigation systems were installed in several communities to help small-scale farmers transport water to their fields.

All this work was accompanied by individual and institutional capacity development. ICBA hosted 48 interns from six countries and organized special technical training courses for 218 specialists from 28 countries. To create more opportunities for Arab women scientists and narrow the labor gender gap in agricultural sciences in the Arab region, ICBA launched the first edition of the Arab Women Leaders in Agriculture fellowship program AWLA and enrolled 22 fellows from Algeria, Egypt, Jordan, Lebanon, Morocco and Tunisia.

These achievements were possible thanks to strong partnerships ICBA has built over the years. The center continued to expand its network of partners by signing 47 new cooperative agreements with various organizations. To create a dedicated platform for cooperation and discussion focused on the challenges and opportunities for food production and agriculture in marginal environments, ICBA also rolled out the first edition of the Global Forum on Innovations for Marginal Environments.

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. So we thank everyone for helping us to make a positive change, especially in the lives of smallholder farmers and rural communities around the world. And as 2020 begins another chapter in ICBA's history, we look forward to continuing to deliver on our shared vision of sustainable livelihoods and food security in marginal environments.

ICBA at a glance



the reach and impact of its programs. It has partners in more than 50 countries, enabling it to leverage a vast and diverse pool of expertise to achieve a greater impact on the ground.

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



ICBA is a 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.

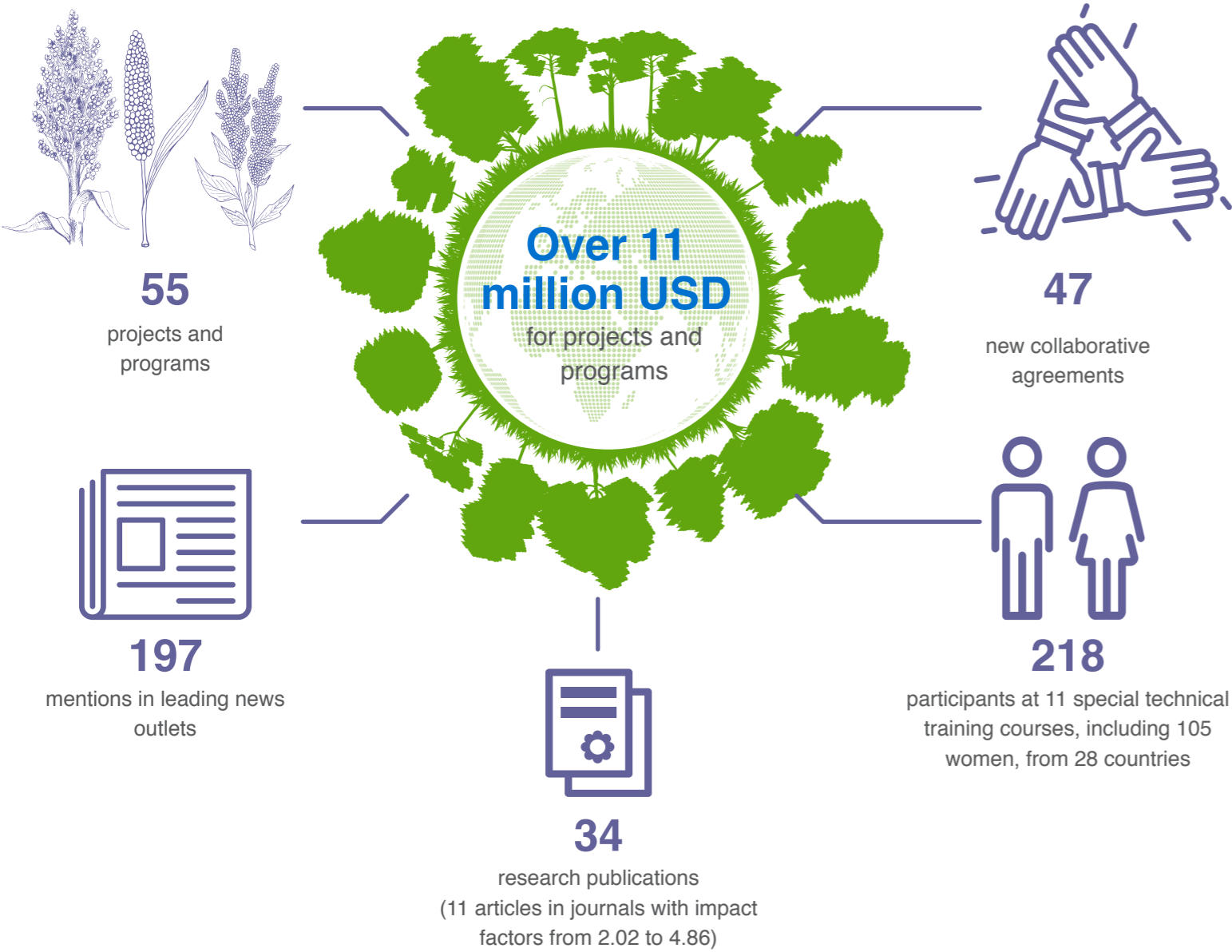
Since its formation in 1999, the center has implemented programs in over 30 countries in Central Asia, the Middle East, North Africa, South Asia, South Caucasus and sub-Saharan Africa. ICBA has also expanded its network of partners around the world to increase

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

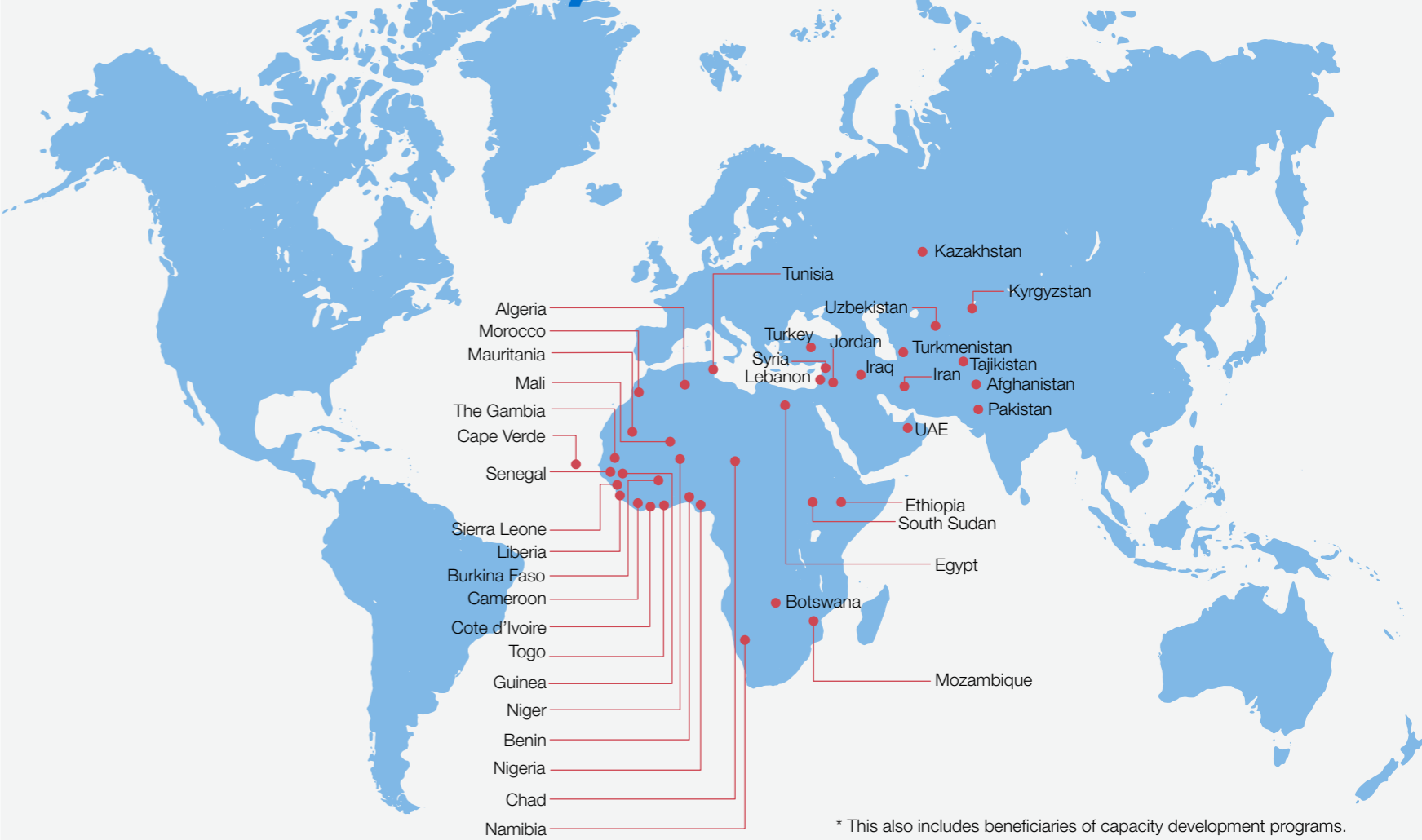
ICBA contributes to the achievement of seven Sustainable Development Goals (SDGs):



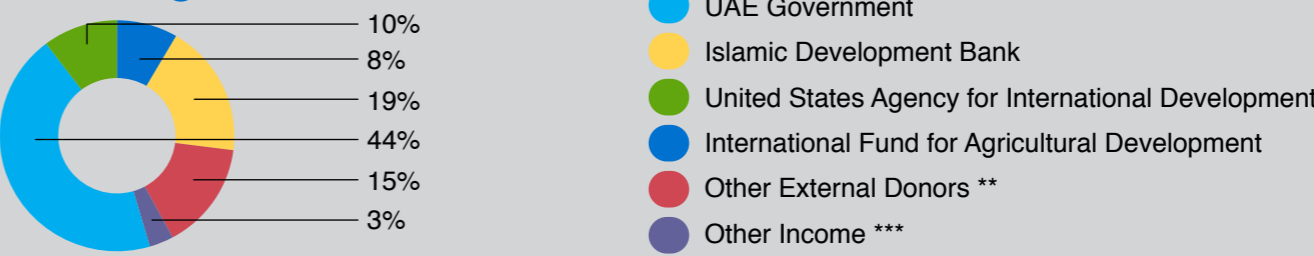
2019 in numbers



39 beneficiary countries*



Funding Sources



** The full list of supporters and contributors is presented on page 107.
*** This includes interest income and income from the Emirates Soil Museum.

Some
736
million
people live
in extreme
poverty
worldwide.



1 NO
POVERTY



**End poverty in all its
forms everywhere**

The pace of poverty reduction is slowing down. And extreme poverty is becoming more concentrated in South Asia and sub-Saharan Africa. These regions are home to around 80 percent of all people living on less than 2 USD a day.

And most of the extremely poor rely on subsistence farming. By one estimate, there are around 500 million smallholder farming households globally.

Lacking adequate skills and resources, 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.

Salt-tolerant plants give hope to smallholders in Ethiopia

Ethiopia ranks first in Africa in terms of the territory affected by salinization. More than 11 million hectares are degraded by salinity and sodicity to varying degrees.

This is a big problem for smallholders who dominate the agricultural sector and number in millions. The sector accounts for roughly 40 percent of the country's GDP, 80 percent of the total employment and 70 percent of the exports.

But the problem is worsening in irrigated areas due to poor irrigation practices and lack of drainage facilities, among other things. And recurrent droughts are adding to the problem.

The economic and social costs 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 poverty and food insecurity. The loss of income hits women and children hardest.

To help smallholders restore their lands and turn their fortunes around, ICBA has been implementing since 2015 a five-year project with funding from

the International Fund for Agricultural Development (IFAD).

Under the project called "Rehabilitation and Management of Salt-affected Soils to Improve Agricultural Productivity", ICBA has introduced jointly with national partners a range of soil, water and crop management strategies to boost farming in different regions of the country. Around 25 genotypes of salt- and drought-tolerant food and forage crops have been tested and evaluated so far.

H.E. Dr. Kaba Urgessa, State Minister, the Ministry of Agriculture of Ethiopia, says: "This project is of immense importance for Ethiopia because it is directly helping resource-poor smallholder farmers, especially women and children, who are facing food insecurity due to their high dependency on marginal water and land resources. The project has played a crucial role in characterizing salt-affected areas in Ethiopia and by introducing alternative salt-tolerant

food and forage crops to improve productivity of marginal areas."

As a result of this work, 15 ICBA genotypes of sorghum, cowpea, barley, lablab, Rhodes, Panicum and Cenchrus grasses were registered as varieties and recommended for adoption in 2019. What is more, eight seed multiplication units were established across Ethiopia. These units produced some 3 tonnes of seeds of various crops which were distributed among around 1,100 smallholders.

The project team also trained 225 farmers, extension workers and irrigation scientists in improved soil, water and crop management practices. This encouraged some 800 farmers to start growing the new varieties in an area of over 2,000 hectares of land.

It is hoped that over 100,000 hectares of salt-affected lands in Ethiopia will have been reclaimed by the time the project ends. This will surely be good news for thousands of smallholders who depend on their land and livestock for food and income.

Field trials of several salt- and drought-tolerant crops in Ethiopia have shown promising results.

Smallholders in sub-Saharan Africa pin high hopes on biosaline agriculture

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 range of challenges to their agricultural activities. But salinization stands out for its scale and impact. One estimate puts the territory affected by salinity in the region at over 19 million hectares. The causes vary from inappropriate irrigation practices to groundwater over-abstraction to seawater intrusion.

To help smallholders mitigate and adapt to salinization, ICBA launched in 2019 a major four-year project in seven sub-Saharan African countries: Botswana, The Gambia, Liberia, Mozambique, Namibia, Sierra Leone, and Togo.

Dr. Ismahane Elouafi, Director General of ICBA, says: “Salinity is one of the critical issues in sub-Saharan Africa;

it is adversely affecting agricultural production, rural livelihoods, economy, and sustainable development in the region. As the world’s leading biosaline agriculture center with about 20 years of experience in managing and rehabilitating salt-affected lands in more than 30 countries, I am confident that ICBA along with its partners in sub-Saharan Africa will make a difference in the lives and livelihoods of smallholder farmers in the seven target countries.”

The project aims to increase agricultural productivity and incomes of farming communities in salt-affected agricultural areas by introducing salt-tolerant crops and associated agronomic management practices; developing value chains for new cropping systems; and building capacity of farmers and extension workers in salinity resilience and climate-smart agriculture. Last year the project team conducted a series of preparatory activities to establish best practice hubs in the countries. As part of this work, scientists mapped and

assessed agricultural areas for project implementation and carried out surveys among smallholders to better understand their challenges. These surveys confirmed that soil and water salinity tops the list of farmers’ concerns.

Under the project, scientists also developed climate risk profiles for all countries, as well as salinity maps which will be ground-truthed in 2020. Through a series of stakeholder workshops, water policy reviews for five countries were prepared to identify the challenges and opportunities for effective water management.

The project aims to benefit around 11,550 smallholders in the target areas. It is expected that the productivity of their lands will increase by 30 percent and economic returns by 20 percent.

Called “Improving Agricultural Resilience to Salinity through Development and Promotion of Pro-poor Technologies” (or RESADE), the project is financed by the International Fund for Agricultural Development (IFAD) and the Arab Bank for Economic Development in Africa (BADEA).



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

Moroccan rural women come together to strengthen local quinoa value chain

At first glance Mrs. Hafida El Filahi, Mrs. Kenza Laghchaoud and Ms. Fatiha Rostan look no different from any other rural women in Morocco. They live in a far-away area called Bourrous in Rehamna Province, about 320 km from Morocco's capital of Rabat, and lead a mundane country lifestyle, looking after their households. But that is what appears on the surface. Unlike most of the rural women in the country, they are more independent and proactive in many ways. Above all, they enjoy a degree of financial independence and can support their families.

They all work in a cooperative which employs 30 women from nearby villages. Aptly named "3ème Millénaire" (or the 3rd Millennium in English), the cooperative produces, markets and sells a range of value-added products such as couscous - a national dish usually made of durum wheat, and sometimes of barley or maize.

For a long time, a variety of locally grown cactus had been a basic ingredient in many of their products. But due to an attack of insect called cochineal, which completely devastated the cacti in the area, they had to look for alternatives. This is when ICBA reached out to the

cooperative as part of a project supported by Canada's International Development Research Centre (IDRC) and implemented jointly with the Mohammed VI Polytechnic University (UM6P), the Ministry of Agriculture, Fisheries, Rural Development, Water and Forests of Morocco and several other national partners. Scientists offered them to start growing and using the center's quinoa genotypes adapted to local conditions.

As the genotypes did well, the demand for the crop rose. Many women from the cooperative, including Mrs. Hafida El Filahi, started cultivating quinoa on their farms.

Mrs. Hafida El Filahi says: "Our cooperative was created in a rural area suffering from poverty and drought. The cooperative gathered poor women from the area and gave them jobs. We are producing 30 types of traditional couscous from millet, jujube, cactus, barley, wheat, maize and other crops. And we started recently using quinoa to make gluten-free couscous thanks to the project."

Since the project began in 2017, ICBA has supplied the cooperative with quinoa seed and processing equipment and provided necessary training. Today the cooperative has become an important link in the national quinoa value chain as it buys produce from smallholder farmers in the area and sells its products across the country.

It is hoped that more than 1,000 small-scale farmers and their family members will benefit from the project in the province alone.

A women's cooperative in Rehamna Province, Morocco, makes and sells food products from quinoa and other crops to support their families and communities.

Quinoa changes farmers' lives in Egypt's salt-affected areas

Agriculture accounts for a large part of Egypt's gross domestic product. In 2018 it contributed around 11.2 percent to the country's economy, totaling some 13.2 billion USD. As important as it is, however, the sector face many problems.

One is soil salinity. It remains a major constraint to agricultural productivity in many areas. As a result, smallholder farmers suffer from low yields and thus make meagre profits if any.

Suez, a seaport city in northeastern Egypt, is one of the areas highly affected by salinity. Much of the land in and around Suez has high levels of salinity and alkalinity, a problem exacerbated by the city's proximity to the Suez Canal.

In 2010 ICBA initiated collaboration with local authorities and stakeholders to

help local farmers better deal with the problem through the cultivation of salt-tolerant crops.

As part of this collaboration, ICBA implemented two projects to tackle soil salinity in the area, helping to reclaim about 63 hectares of previously uncultivable land and improving the livelihoods of many local farmers.

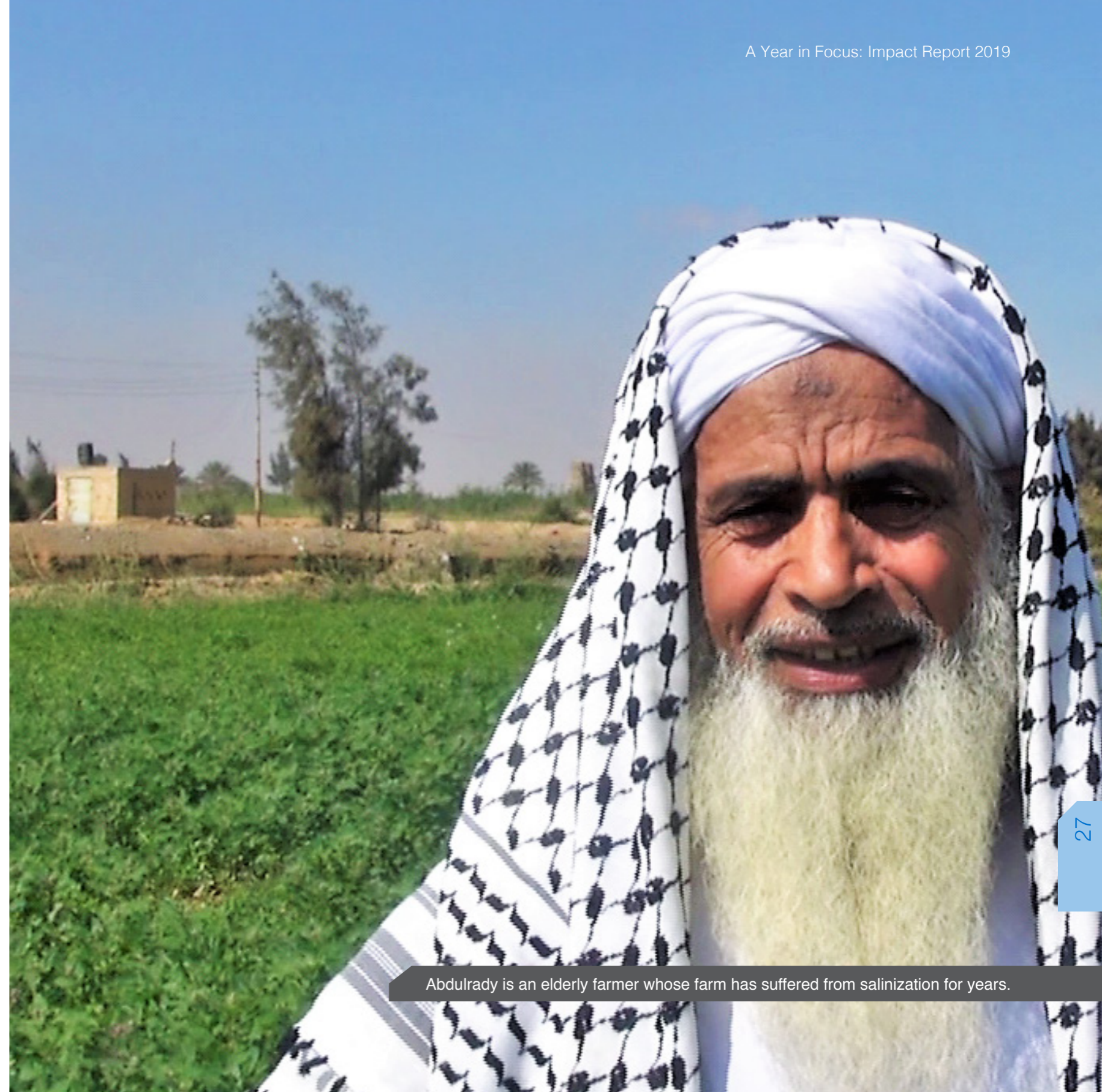
One of them is Abdulrady, an elderly farmer whose 8.4-hectare farm had suffered from salinization for years.

Abdulrady says: "I lacked the expertise to deal with this problem on my farm. The soil was highly saline. One day I heard about a biosaline agriculture project that was coordinated by

the Desert Research Center, and immediately reached out to them. The research team was very responsive. They inspected the soil, analyzed the water, and advised me to grow quinoa. I was lucky to have benefited from the team's comprehensive training in cultivating, harvesting, post-harvest processing, and even marketing produce."

That was the first time he learned about quinoa. Under the projects, Abdulrady and other farmers also regularly attended farmer field schools.

Since then, Abdulrady has grown quinoa. Today he earns enough from his farm to provide for his six-strong family.



Abdulrady is an elderly farmer whose farm has suffered from salinization for years.

More than
820
million people
do not have
enough to eat.



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

Global hunger is still on the rise. Around 821 million people were estimated to be undernourished worldwide as of 2017. Asia accounted for nearly 63 percent of the world's hungry.

The prevalence of undernourishment is most worrying in sub-Saharan Africa, East Africa and South Asia.

Climate change-induced drought and salinization threaten smallholder farming in these and other regions where agriculture employs roughly 40 percent of the labor force and provides most of the food. As staple crops produce little or fail, rural communities are faced with undernourishment and hunger.

Rural communities in Morocco look to quinoa for food and income security

Salinization and drought leave many smallholder farmers across Morocco in a tight spot. Around 30 percent of the irrigated land in the country suffers from varying degrees of salinity. As a result, average yield losses are reckoned to be as high as 50 percent, with some estimates putting economic costs above 0.2 billion USD per year.

To sustain their livelihoods under unfavorable environmental conditions, more and more smallholders are turning to highly resilient and nutritious plants such as quinoa thanks to a project funded by Canada's International Development Research Centre (IDRC). The crop is more tolerant of abiotic stresses and nutritious, containing all nine essential amino acids. Above all, there is growing awareness about its health and other benefits and demand is picking up.

Targeting rural communities mainly in Rehamna Province, the project focuses on strengthening the whole quinoa value chain – from seeds to consumer products. ICBA has been working with the Mohamed VI Polytechnic University (UM6P), the Ministry of Agriculture, Fisheries, Rural Development, Water and Forests of Morocco and several other national partners since 2017 to address such constraints as lack of

access to well-adapted and high-yielding varieties, inadequate crop management practices, and limited market demand, among others.

To supply farmers with quality seed, ICBA is helping farms, cooperatives and agri-business start-ups to establish seed production units. Two were set up and produced five tonnes of seed in 2019.

As ICBA's genotypes yield, 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 farmers are adopting them. Last year 200 farmers planted these genotypes in an area of 250 hectares.

Scientists are also helping farmers to increase their profits. As a result of mechanization, for example, farmers managed to reduce production costs from 2.62 to 1.89 USD per kilogram.

The project also provides farmers with necessary tools and skills.

Dr. Juan Pablo Rodríguez Calle, a post-doctoral fellow at ICBA, says: "Technical assistance and capacity

development are important components of our project. We work with our local partners to develop a wide range of tools for planting, harvesting and processing quinoa and build the capacity of farmers, especially women, in these fields."

Last year scientists trained 200 farmers and extension specialists, including 50 women, in best practice in quinoa cultivation and food production. This training helped a farmers' cooperative obtain the Hazard Analysis Critical Control Point certification as an organic producer.

The project is expanding its reach to other parts of the country as well. Jointly with the OCP Foundation, ICBA trained 70 farmers in quinoa production and valorization in Youssoufia Province.

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

Faced with environmental challenges, more and more smallholder farmers in Morocco are taking up quinoa cultivation.

Scientists search for key quinoa genes

Marginal environments are not quite hospitable for farming. More often than not, water is scarce, and salinity is high. Drought and heat make things worse. Staple crops like rice, wheat, and maize fare badly in these conditions. So smallholder farmers need alternatives. And quinoa is one such crop thanks to its exceptional resilience and nutritional profile.

It has a very diverse gene pool catering for almost every combination of abiotic stresses in marginal environments. So it is important to identify genes or quantitative trait loci (QTL) responsible for agronomic and biochemical traits in quinoa so that they can be used in breeding genotypes for different agro-ecosystems.

This is the main goal of the project on genome-wide association studies of quinoa launched by ICBA in 2019 in collaboration with the Max Planck

Institute, Germany, and the BGI Group, one of the world's largest genomics companies.

As part of the project supported by the Islamic Development Bank (IsDB) and the UAE Government, scientists began analyzing 190 genotypes of quinoa at ICBA's research station in Dubai, the UAE, for different traits such as tolerance to various levels of salinity; flowering duration; plant height; panicle length; branching; days to maturity; seed yield; seed weight; and seed saponin.

They are also working to develop sweet varieties of quinoa with reduced content of saponin, a compound which makes grains bitter. Saponin can be removed by repeated washing or dehulling, but these methods increase post-harvest processing costs. Although there are a few genotypes with low saponin content, their performance has not been found to be satisfactory under marginal conditions of the Middle East and North Africa, as

well as Central Asia.

Dr. R. K. Singh, Program Leader on Crop Diversification and Genetics at ICBA, says: "The project will help us to fast-track our quinoa breeding programs. We hope to be able to develop genotypes adapted to very specific environmental conditions with the best qualities of the plant."

The project aims to ultimately breed high-yielding early-maturing (90-100 days) quinoa genotypes with high levels of abiotic (salinity, drought, and heat) stress tolerance for marginal areas; as well as develop associated best management practices and optimum post-harvest management practices.



Researchers at ICBA conduct genome-wide association studies of quinoa to fast-track the development of genotypes best suited to marginal environments.

ICBA, HSBC team up to spur climate-smart agripreneurship in Egypt, UAE

Many small-scale farmers in marginal areas of Egypt and the UAE face a dilemma. On the one hand, farming is challenging due to unfavorable environmental conditions. As a result, yields and profits are low. On the other hand, it is a source of livelihood which is hard to give up. But to produce and earn more, they need know-how and technology.

This is the idea behind a new project launched in 2019 by ICBA and HSBC Bank Middle East Limited in Egypt and the UAE. Part of the Food for the Future program, the project is designed to enable farming communities to prosper and drive rural development through sustainable and climate-smart agricultural approaches. These include, among others, the introduction of such crops as quinoa and Salicornia and the

development of value chains for these crops.

The main goal is to help small-scale farmers realize their potential and become successful agripreneurs.

Mr. David Ramos, Senior Manager, Sustainability, HSBC Bank Middle East Limited, says: “Developing entrepreneurial skills and promoting sustainable supply chains are part of our corporate sustainability mandate. We do this through supporting initiatives that help companies and their supply chains grow sustainably. Our partnership with ICBA strengthens this line of work, introducing an

innovative approach that helps ensure the farmer’s environmental and financial sustainability by bringing marginal environments into production and addressing the increasing need for farming land in the region.”

The project also targets farmworkers in the UAE and aims to equip them with necessary knowledge and skills through an interactive mobile application.

The project builds on the success of the first phase of the Food for the Future program. Over the coming years, the Food for the Future program seeks to develop and disseminate an innovative model of agripreneurship in the Middle East and North Africa region.

Small-scale farmers in Egypt and the UAE need climate-smart technologies to become successful agripreneurs.

Women make up nearly 50 percent of the agricultural labor force in East and Southeast Asia and sub-Saharan Africa.



5 GENDER
EQUALITY



**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.

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 remains largely untapped.

Arab women scientists set sights on transforming agricultural R&D

In the Middle East and North Africa, women account for just 21 percent of the total labor force and contribute 18 percent to the region's overall GDP. If the labor gender gap had been narrowed over the past decade, the GDP growth rate in the region could have doubled or increased by some 1 trillion USD in cumulative output. This is a huge missed economic opportunity.

The labor gender gap exists in almost every sector, including research and development. 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.

To help narrow the labor gender gap in science in the region, ICBA launched in 2019 the first edition of the Arab Women Leaders in Agriculture program. Thus, a select group of promising Arab women scientists became the first fellows of the program. The group included 22 women researchers from Algeria, Egypt, Jordan, Lebanon, Morocco, and Tunisia.

The program began with the first workshop in Tunis, Tunisia, involving mentoring orientation and positive leadership sessions.

Dr. Mouldi El Felah, Full Professor of Agronomy and Genetics from Tunisia, says: "AWLA is a very important and innovative program. What I found during the workshop is that the approach is very clear and helpful for women fellows who will take on leadership roles in agriculture in the future. In this way, AWLA works to address an important issue, namely the gender gap in the region."

Funded by the Islamic Development Bank (IsDB), the Bill & Melinda Gates Foundation (BMGF) and the CGIAR Research Program on Wheat, the program's mission is to develop a cadre of aspiring Arab women researchers equipped with the knowledge and skills to make a positive difference in agricultural sustainability and food security in their countries in particular and the region as a whole.

As part of the program, the fellows will set up the first research and development forum to address pressing regional agricultural challenges and take part in the region's first networking platform for women researchers working across

agricultural and food security-related disciplines.

The program aims to facilitate fellows' access to leadership roles and promote research excellence and impact, encourage gender-responsive working cultures and enabling environments, and provide Arab women researchers with platforms to showcase their capabilities and contributions.

Its 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 inaugural cohort of the Arab Women Leaders in Agriculture program includes leading women scientists from six countries.

**Around
4 billion
people experience
severe water
scarcity during at
least one month
of the year.**



Ensure availability and sustainable management of water and sanitation for all

Over 2 billion people live in water-stressed regions. Around half a billion endure water shortage year-round.

As climate change is shifting precipitation patterns and speeding glacial melt, water supplies are set to decline and floods and drought to intensify. As many as 700 million could be displaced by intense water scarcity globally by 2030.

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

Farming with reject brine and seawater

Most of the countries in the Middle East and North Africa region are water-stressed. To meet their freshwater needs, many resort to groundwater and seawater desalination. This, however, causes a big salty problem: reject brine, a harmful by-product of desalination. It is a serious environmental threat which exacerbates soil and water salinization. ICBA views both reject brine and seawater as resources for food production and develops technologies that make better use of them.

With support from the UAE Government and the Islamic Development Bank (IsDB), since 2014 the center has implemented a research program on inland and coastal integrated agri-aquaculture systems in the UAE 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. The coastal system uses seawater directly to grow fish and the resultant effluent to irrigate halophytes such as Salicornia.

Dr. Dionysia Angeliki Lyra, a halophyte agronomist at ICBA, says: “One of the main goals of our research program is to develop a cost-effective production model that transforms reject brine and seawater into useful resources for farmers. This will help to increase their food production and income.”

Under this program, ICBA received in 2019 grants from HSBC Bank Middle East Limited, Expo 2020 Dubai’s Expo Live Innovation Impact Grant Program and Phosboucraa Foundation to introduce the systems in Egypt, the UAE and Morocco respectively.

As part of these projects, scientists started collaboration with different partners to tailor the systems to local environments, develop guidelines for the safe disposal of reject brine and build the capacity of farmers, farmworkers and extension specialists.

Scientists also partnered with Global Food Industries, a company based in the UAE, to make Salicornia-based burgers, meatballs and nuggets. They also continue to work with several chefs in the country to devise recipes with halophytic vegetables.

Building on the past research, the center also began a breeding program to improve 16 Salicornia genotypes. The program aims to develop a halophyte-based value chain which creates better opportunities for farmers in marginal environments.

ICBA’s innovative inland and coastal modular systems make use of reject brine and seawater to grow fish, vegetables and halophytes in desert environments.

Helping Jordanian farmers save water and money

A major multi-stakeholder project is helping farmers in two Jordanian governorates to save water resources and cut down on energy bills by introducing water-saving technologies.

Under the five-year project called “Water Innovation Technologies”, ICBA is working with Mercy Corps, Jordan River Foundation, Royal Scientific Society, and the International Water Management Institute, among others, to improve water use efficiency on farms in Mafraq Governorate and Azraq district, Zarqa Governorate. Funded by the United States Agency for International Development (USAID), 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. This work is contributing to stimulating the demand for water-saving technologies and practices by influencing the behavior

of pioneer farmers. As a result, farmers are reducing water consumption on their farms and associated costs.

Ms. Seta Tutundjian, Director of Programs at ICBA, says: “Overirrigation is a serious problem in Jordan. Through this project, we want to show that considerable water and energy savings are possible. This will help farmers to reduce production costs and increase profits.”

Launched in 2017, the project is already producing positive results as one of the farmers, Mr. Abu Kishek, has succeeded in saving about 158,490 cubic meters of water since March 2018. What is more, he also saved about 20,422 Jordanian dinars (around 28,804 USD) on his electricity bills from April 2018 to 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.

The project aims to help more farmers and target other actors in the sector in Jordan. The goal is to save about 18.5 million cubic meters of water by 2022 through addressing constraints on the adoption of water-saving technologies in agriculture and households. Lack of knowledge and information and access to appropriate financing are regarded as some of the main challenges.

As part of the project, ICBA is now exploring new water-saving interventions, which include the introduction of soil amendment techniques and climate-resilient crops such as quinoa that consume less water compared to staple crops.



Water-saving technologies help farmers in Jordan to cut down on water and energy consumption.

Boosting food security in sub-Saharan Africa through solar-powered irrigation systems

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.

Most of the irrigated farms in the region rely on groundwater or river water. But transporting it to the fields is a big hurdle due to lack of infrastructure and finance. As a result, only 2 percent of the renewable water resources are used for irrigation and just 4 percent (6 million hectares) of the cultivated area is irrigated.

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 (OFID) and implemented by ICBA jointly with the ministries of agriculture 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: “Our project aims to tackle two challenges: lack of water and lack of electricity. 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 irrigation 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. The system in Burkina Faso is shared by 25 vegetable growers, while the one in Mali is managed by 90 women farmers.

Smallholders also formed associations to manage water distribution and collectively supply local markets with their produce. Similar arrangements were also made in Niger and Senegal.

To help farmers and extension specialists better manage water resources, scientists also determined crop water requirements and irrigation schedules which can reduce irrigation water use by 20 percent and increase yields by 15 percent.

They show real promise 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.

Smallholder farmers in Burkina Faso start using solar-powered small-scale irrigation systems to increase agricultural productivity and income.

Improving cooperation in Euphrates-Tigris River Basin

The Euphrates and Tigris River Basin is a region that is highly vulnerable to climate change. The riparian countries are interdependent and rely on water from the river system to maintain ecosystem services, agriculture and energy production, municipal and industrial water supply. The system is also affected by salinity, land degradation and deterioration of marshlands and ecosystems.

To varying degrees, these problems are common to the countries that share the basin: Jordan, Iran, Iraq, Saudi Arabia, Syria and Turkey. As it is a transboundary river system, it is important to ensure effective regional collaboration to address the current and future challenges.

This was the main idea behind the Collaborative Program Euphrates and Tigris, a regional initiative funded by the Swedish International Development Cooperation Agency (SIDA) and implemented jointly with the Stockholm International Water Institute (SIWI), the American University in Beirut (AUB), the Stockholm Environment Institute (SEI), the International Center for Agricultural Research in the Dry Areas (ICARDA), the Swedish Meteorological and Hydrological Institute (SMHI), as well as national government and research institutions.

ICBA conducted the program in Iraq, Syria and Turkey from 2013 to 2019. The three countries represent 80 percent of the basin’s total area. The program aimed to improve, among other things, dialogue and cooperation among the three countries through increased access to information and transfer of knowledge on water management in the region.

Dr. Khalil Ammar, Program Leader on Sustainable Natural Resources Management at ICBA, says: “Transboundary water management requires a shared understanding of the challenges and solutions among the upstream and downstream countries. Our goal was to build trust and establish mechanisms of collaboration among different stakeholders from the countries so that solutions agreeable to all could be developed.”

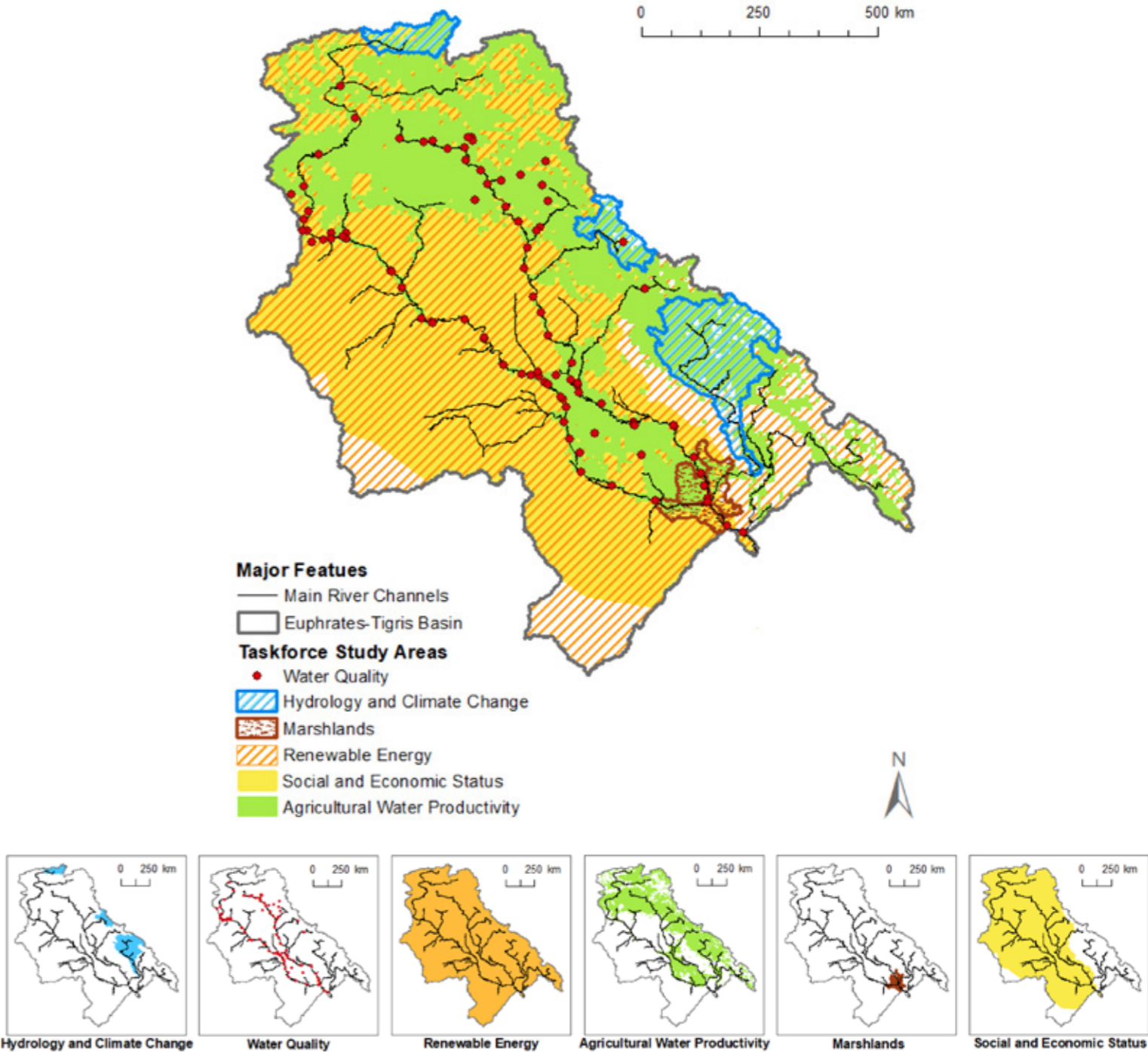
The program provided a rigorous evidence base to evaluate transboundary impacts and enable the identification of a range of water management options and a regional investment program. The thematic priority areas included hydrology and climate change, hydropower, water

quality, agricultural water productivity, marshlands and socioeconomic aspects.

The program also supported the countries in generating and using commonly agreed evidence-based information on regional water use and services. It succeeded in bringing together experts from Iraq, Syria and Turkey to work towards addressing the challenges in transboundary water management. It served as a neutral scientific platform supported by international experts that helped the country partners to work transparently and exchange knowledge.

Thanks to the collaboration between national and international partners, the program managed to facilitate a diverse range of analyses and studies in the countries. As a result, seven comprehensive reports were produced on the agricultural, socioeconomic, environmental and energy aspects of water management in the basin.

To support decision-making, the program also developed eight policy briefs and a synthesis report with over 30 recommended actions.



Climate change poses serious risks to populations that depend on the Euphrates and Tigris River Basin.

56 **2019**

**was the
second
warmest
year in
recorded
history.**





**Take urgent action to
combat climate change
and its impacts**

Global climate data shows that 2010-2019 was the hottest decade ever recorded. As the planet is warming, 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.

Enhancing drought preparedness in Middle East, North Africa

Periodic drought is a threat to food and water security in the Middle East and North Africa. It increases pressure on scarce water resources, impacting social and economic development.

The most recent droughts have revealed the limitations in drought management in the region and the need to support the governments and populations in managing drought impacts. What is more, data from the major Global Climate Models shows potential future rises in temperature, decreases in rainfall and increases in drought frequency, intensity and duration. It is, therefore, important to improve methods for characterizing and managing drought risks in the region.

This was the rationale behind a five-year project called “The Middle East North Africa - Regional Drought Management System” which concluded in 2019. Funded by the United States Agency for International Development (USAID), the project helped to develop new insights, management plans and drought resilience strategies that will reduce drought impacts on food and water

supply in vulnerable communities in Jordan, Lebanon, Morocco and Tunisia.

ICBA also supported the four countries in establishing state-of-the-art systems to monitor regional drought conditions and assisted with drought planning and coordination activities. More importantly, scientists provided technical assistance and training in the operation of monitoring and early warning systems, developed communications and information delivery technology, and conducted stakeholder engagement activities. In 2019, for example, scientists organized training courses for a group of 16 engineers in Jordan and four engineers in Morocco.

The project focused on developing regional and national drought monitoring and early warning systems, vulnerability and impact assessments, and preparedness plans for responding to and mitigating drought effects.

Mr. Rashyd Zaaboul, a climate modeling scientist at ICBA, says: “As droughts become more common and

severe in the region, governments need to have comprehensive mitigation and response plans in place. It is also necessary to have a system of continuous drought monitoring to act well before extreme events happen.”

As an extension of this work, ICBA conducted a study supported by the Food and Agriculture Organization of the United Nations (FAO) to assess the possibilities and challenges of using drought risk insurance in the region. The study concluded that data availability and credibility is a fundamental requirement for the adoption of indemnity-based and index-based insurance programs in the region.

This work served as a catalyst to improve the region’s drought early warning systems and create an environment of proactive drought risk management.

Climate change makes droughts more frequent and extreme in the Middle East and North Africa.

Globally, there
are roughly
400,000
plant species on
the planet. Today
this biodiversity
is at risk.



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. Climate change, habitat conversion and over-exploitation of natural resources are just some of the main factors.

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.

ICBA's genebank becomes more accessible to the world

The history of ICBA's genebank dates back to 2000. Its mission is to serve as a unique repository of plant genetic resources suited to marginal environments.

Since then, ICBA has collected and preserved germplasm of plant species with proven or potential salinity, heat and drought tolerance from around the world.

Today the genebank is home to one of the world's largest collections of germplasm of heat-, drought- and salt-tolerant plant species. It stores over 14,524 accessions of around 270 plant species from more than 150 countries and territories. There are also around 250 seed samples of 70 wild plant species from the UAE, the center's host country.

In 2019 ICBA signed an agreement with the Food and Agriculture Organization of the United Nations (FAO) within the framework of Article 15 of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Under this agreement, the germplasm collection at ICBA's genebank became officially part of the Multilateral System of Access and Benefit-sharing, adding to 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. Kent Nnadozie, Secretary of the International Treaty, says: "With this agreement, ICBA's valuable germplasm collection will be more accessible to a broader range of users and ultimately farmers, while affording ICBA new partnerships and involvement in the global governance framework provided by the International Treaty. This is another important step forward in international access and benefit-sharing of plant genetic material, which form the basis for the world's food basket."

The Multilateral System of Access and Benefit-sharing currently comprises over 2.6 million samples of crop germplasm. Material in this vast global gene pool is exchanged around the world at an average rate of about 1,000 transfers per day to support farmers, plant breeders and scientists in developing new climate-resilient crop varieties to produce more nutritious food from plants.

The FAO International Treaty is a key international legal instrument for the global conservation, sustainable use and sharing of the benefits of plant biodiversity, which it does through its various mechanisms, most notably the Multilateral System, the Global Information System and the Benefit-sharing Fund. It is also the first legally-binding international instrument to acknowledge the tremendous contribution of indigenous communities and farmers to the development and management of crop biodiversity.

ICBA stores over 14,524 accessions of some 270 plant species from around the world.



Using drones to understand how date palms cope with red palm weevil

Date palm is a culturally and economically important fruit tree in the Arabian Peninsula. There are currently over 1,500 known date palm varieties, and nearly 250 of those are cultivated in the peninsula.

Date production is, however, undermined by different abiotic and biotic threats. To understand how different factors affect date palm productivity, ICBA has conducted the longest-running research program in the UAE since 2002. The program has investigated the effects of salinity and other stresses on 18 date palm varieties. Over the years, however, some of the trees have become infested with red palm weevil, a dangerous insect, while others have not.

Although the tree is normally tolerant of heat, drought and to some extent salinity, it is particularly vulnerable to red palm weevil. The pest is capable of seriously

damaging trees, causing their demise. This leads to major economic losses worldwide.

Early detection is, therefore, crucial. But it is difficult because there are few externally visible symptoms that indicate the presence of the pest. So field teams usually look for small insect entry holes in the base or crown of each tree. This is inefficient as date palm plantations may have hundreds, thousands and more trees.

In 2019 ICBA began a study to see how drones can help to identify infested trees and how different varieties respond to the insect. Initial results showed a clear pattern of sensitivity and tolerance among the varieties. Scientists used drones to locate the damaged trees through canopy phenotyping and find out the varieties most susceptible to the pest.

Dr. Zied Hammami, a post-doctoral fellow at ICBA, says: “Red palm weevil is a serious threat to the cultivation of date palms. Our study aims to shed new light on how we can use drones for early detection and what makes some varieties more resistant to the pest than others.”

There is currently no research that explains the genetic basis of resistance mechanisms against red palm weevil in date palm. Scientists hope to fill in this gap. They now plan to run a large-scale experiment on controlled red palm weevil infestation to figure out if tolerance in some varieties is genetically determined.

Drones help to pinpoint date palms infested with red palm weevil.

Tracing agricultural heritage in UAE

As part of the conservation of plant genetic resources in the UAE, ICBA conducts regular expeditions to different locations to collect some of the important indigenous species and store them in its genebank for the future.

As a result of several botanical expeditions to the mountainous areas of the emirate of Ras al-Khaimah from 2015 to 2019, a team of scientists from ICBA identified and studied four local cereal varieties.

During the expeditions, they studied how local farmers cultivate one landrace of barley and three landraces of wheat in the areas.

In a study published in *Tribulus*, a journal of the Emirates Natural History Group, scientists reported that local farmers have grown barley and wheat for generations. It was the first time that the cultivation of local accessions of barley and wheat had been reported in the UAE.

Dr. Mohammed Shahid, a geneticist at ICBA, says: “The study helps us to better understand current farming practices in these areas but also how they have been shaped from one generation to another. The cultivation of these landraces may also provide some clue about the agricultural practices of the past.”

They found that the native wheat is grown primarily for food, but also occasionally for fodder. The local barley grain is mostly used as chicken feed, while the biomass as forage.

Most local farmers plant local wheat and barley on their plots only if there is plenty of rainfall in November. Otherwise, the plots are left empty. They also use their own seed instead of buying it on the market.

As part of the study, scientists collected germplasm of the four landraces and deposited it in the center’s genebank, which has some 5,000 accessions of barley from over 100 countries and more than 60 accessions of wheat.

This germplasm is important for future breeding and research as the latest observations show that many farms are no longer cultivated in the areas, with plots remaining fallow throughout the season. Scientists say it is an indication of declining interest in farming, which could lead to the loss of the traditional practices.

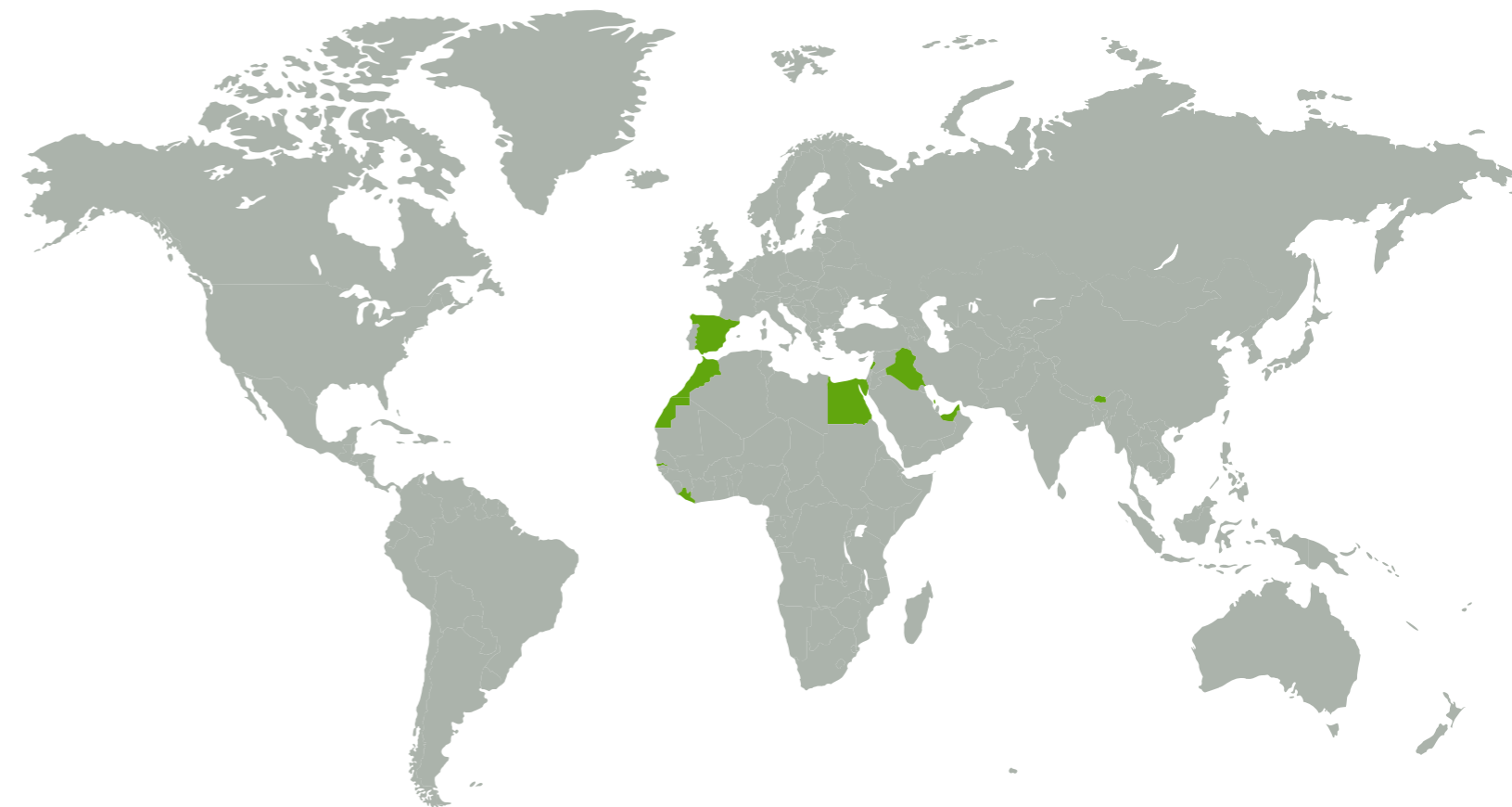
Scientists collect and conserve landraces in the UAE for future generations.

Sharing plant genetic resources

Under its mandate for marginal environments, ICBA collects, conserves and shares germplasm of plant species with proven or potential salinity, heat and drought tolerance. This work is supported by the UAE Government and the Islamic Development Bank (IsDB).

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

In 2019 the center supplied seed samples of 14 crops to partner organizations in 10 countries.



**Partnerships
are key to
achieving the
Sustainable
Development
Goals.**





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

Today the world faces a plethora of threats. 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 address them. National, regional and international organizations also must join forces and support governments. Collaboration and partnerships are crucial for progress and success.

Building a global partnership platform for marginal environments

In 2019 ICBA launched the first edition of the Global Forum on Innovations for Marginal Environments as a dedicated platform to facilitate discussions and partnerships.

Organized in collaboration with several partners and sponsors, the forum brought together a diverse mix of stakeholders in Dubai, the UAE.

The forum served as a unique event to showcase the latest advances in research, innovation, development and policy in agriculture and food production in marginal environments.

Over 90 speakers and nearly 300 delegates from more than 40 countries attended a wide range of policy, technology, business and science sessions over two days. The distinguished speakers shared their valuable experiences and ideas about the future of food, water and nutrition security in different parts of the world.

Speaking at the forum, H.E. Mariam bint Mohammed Almheiri, Minister of State for Food Security of the UAE, says: "It is estimated that up to 1.7 billion people live in marginal environments, including 70 percent of the world's poorest. Many of these people are smallholding farmers who are totally dependent on agriculture for their food and income. With populations in these regions projected to rise and with climate change likely to further impact their ability to grow crops because of increased frequency of droughts and temperature rises, there has never been a more important time to explore how we can unlock the latent potential of these regions by employing advanced technology and bioscience to improve crop yield."

Thanks to the support of the Food Security Office and the Advanced Sciences Office of the UAE Government, the Islamic Development Bank (IsDB), the Environment Agency - Abu Dhabi (EAD), the OCP Group, and the Khalifa International Award for Date Palm and Agricultural Innovation the forum succeeded in achieving its goals to establish partnerships and highlight the problems facing rural communities in different parts of the world.

The forum called for more action and support from the public and private sectors to boost research and innovation for food security and sustainable development in marginal environments.



The Global Forum on Innovations for Marginal Environments is the first-of-its-kind platform dedicated to forming strategic partnerships to tackle the challenges in marginal environments through research and innovation.

ICBA, Saudi Ministry of Environment, Water and Agriculture partner to develop biosaline agriculture in Saudi Arabia

In 2019 ICBA inked a strategic agreement with the Ministry of Environment, Water and Agriculture of Saudi Arabia to collaborate on agricultural development and environmental sustainability in Saudi Arabia.

Under the agreement, ICBA will support the ministry in developing biosaline agriculture research and systems, preserving and sustainably managing the environment and natural resources.

According to the ministry: “The MoU includes making use of ICBA’s expertise in capacity development, and agricultural and environmental research, especially in the field of

vegetation development, combating desertification, and climate change adaptation. It also includes training programs for Saudi technicians and farmers, in addition to localizing, implementing and developing biosaline agriculture research and production systems for both crops and forestation, which contributes to environmental and agricultural integration.”

The agreement also stresses the need to prepare proposals for the ministry’s projects involving plant production, drought monitoring systems, development of promising local crop and

forestation varieties, and conservation of plant genetic resources.

Both parties will work together to carry out projects, programs, and technologies that can achieve sustainable environmental and agricultural development and help in the preservation of water resources in the country.

Through this partnership, ICBA will share its extensive technical knowhow and applied experience and develop tailor-made solutions to boost biosaline agriculture research and production in Saudi Arabia.



H.E. Eng. Abdulrahman Al Fadley, Minister of Environment, Water and Agriculture, Saudi Arabia, and Dr. Ismahane Elouafi, Director General of ICBA, signed a collaborative agreement in Jeddah, Saudi Arabia.

ICBA forms partnership with Ministry of Agriculture of Uzbekistan

2019 saw the establishment of a strategic partnership between ICBA and the Ministry of Agriculture of Uzbekistan to step up joint activities on sustainable agriculture and food security in the country.

H.E. Mr. Jamshid Khodjaev, Minister of Agriculture of Uzbekistan, and Dr. Ismahane Elouafi, Director General of ICBA, signed a memorandum of understanding to this effect on the sidelines of a two-day international multi-stakeholder forum dedicated to the problems of the Aral Sea Basin.

The agreement envisages cooperation in developing and introducing innovative technologies and approaches in crop diversification, integrated crop-livestock-forestry systems, seed production and farmer-to-farmer seed delivery programs.

Dr. Ismahane Elouafi, Director General of ICBA, says: “We are delighted to formalize our long-running collaboration with the Ministry of Agriculture of Uzbekistan. This agreement will give further impetus to our collaborative work in the country and enhance our presence in Central Asia and the South Caucasus. We look forward to working with our national partners towards improving food security and nutrition and livelihoods of the most vulnerable rural communities in the country, particularly those living in the Aral Sea Basin, through innovative technologies and approaches.”

Under the agreement, the parties will also collaborate on salinity management and improvement of land and water productivity.

Moreover, joint activities will focus on research on climate change adaptation and mitigation measures, environmental sustainability through evaluation of ecosystem services and resilience of agroecosystems.

ICBA will assist in devising policies and strategies on development of value chains for cash and food crops, including post-harvesting, food processing and marketing to ensure better livelihoods, food security and nutrition in rural areas.

ICBA will also support the development of capacity of national agricultural research institutions through knowledge sharing, training programs, seminars, conferences and collaborative research.



The agreement between ICBA and the Ministry of Agriculture of Uzbekistan formalizes long-running collaboration in the country.

ICBA teams up with James Cook University to step up food security R&D in dryland areas

In 2019 ICBA and James Cook University, a public university in North Queensland, Australia, began collaboration on research and development to enhance food production and agriculture in dryland areas.

The parties signed a memorandum of understanding to the effect in Dubai, the UAE, in the presence of senior officials from the Food Security Office of the UAE.

The organizations agreed to work on developing joint projects on, among other things, genomics, saline and freshwater algae, aquaculture, water recycling and management, and bioremediation.

Professor Sandra Harding, Vice Chancellor and President of James Cook University, says: "It was a wonderful opportunity to gain a better understanding of the deeply impressive work being undertaken by ICBA to achieve sustainable livelihoods for those living in marginal environments. There are many points of connectivity between their priorities and our own and I look forward to an enduring partnership between our two organizations."

The partnership creates new opportunities for achieving a greater synergy and impact by allowing both institutions to tap into each other's unique expertise. Over the years, ICBA has expanded its network of partners around the world to increase the reach and impact of its programs. It has partners in more than 50 countries, enabling it to leverage a vast and diverse pool of expertise to achieve a greater impact on the ground.



ICBA and James Cook University signed an agreement to cooperate in research and development in dryland areas.

Mobilizing youth for innovation in food security, sustainable development

In 2019 ICBA kicked off a new initiative to bring together youth from different countries to foster innovation and socioeconomic development in marginal environments.

Dubbed the ICBA Youth Engagement Society (YES), the initiative will facilitate communication and collaboration between young people in the UAE and their peers abroad to address local and global challenges related to food security and agricultural production in marginal areas. The initiative has a specific focus on encouraging youth contributions to the achievement of the Sustainable Development Goals.

Dr. Tarifa Alzaabi, Deputy Director General of ICBA, says: “We hope that the initiative will attract young people from around the world and encourage

them to contribute to food security and the Sustainable Development Goals so that the best solutions are found by 2030. The ICBA YES initiative will serve as a platform for best practices, innovative approaches and technologies which will be applied on the ground in various countries with the UAE as a starting point. Today’s youth are the producers, scientists and entrepreneurs of tomorrow. In 2020, activities to launch ICBA YES student clubs will be coordinated with universities and youth institutions.”

The initiative adopts a strategic framework that rests on four pillars: inspiration, communication, biodiversity

and agripreneurship. These pillars support finding innovative solutions to food insecurity and other challenges through youth’s cooperation with various stakeholders, including farmers, entrepreneurs and policy-makers.

ICBA is partnering with academic and youth institutions so that young people can tap into the expertise of various researchers and specialists and make practical changes in research, development and training programs.

Through this initiative, ICBA aims to mobilize youth to support innovation for food security, sustainable development and environmental protection.



H.E. Mariam bint Mohammed Almheiri, Minister of State for Food Security of the UAE, launched the ICBA Youth Engagement Society (YES) in Dubai, the UAE.

**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.

Capacity development is an integral part of ICBA's work. In 2019 our scientists focused considerable efforts and resources on identifying different stakeholders' capacity-building needs and catering to them.

They continued to work on strengthening 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.

Extending knowhow to farmers and agri-businesses in UAE

In 2019 ICBA organized two major knowledge-sharing events for farmers and agri-businesses in the UAE.

The first event was an open day at ICBA for UAE-based farmers and agri-businesses. More than 100 farmers, agri-businesses, senior officials and representatives of different government entities from across the country took part in the agri-tech showcase.

Participants learned about a wide range of ICBA's agri-technologies and crops adapted to the local environments.

ICBA also presented awards to several farmers in recognition of their contribution to food security in the country. The farmers had previously worked with the center to field-test ICBA's applied research.

The second event was a four-day training course on integrated agri-aquaculture

systems for desert environments for a diverse group of UAE-based researchers, extension staff and farmers.

Funded by the Islamic Development Bank (IsDB), the training course brought together participants from several emirates and included both classroom and field sessions.

The training course focused on ICBA's technology and experience in using reject brine in integrated systems for farming fish and resultant nutrient-enriched aquaculture effluents for irrigating halophytic forages and vegetables like Salicornia.

As part of the training course, participants also learned about how drones can help in agriculture and observed a field demo of how drones are used for data acquisition.

Mr. Saif Khalfan Al Mansouri, of the Environment Agency - Abu Dhabi, says: "The training course by ICBA was a great learning experience. I only knew about some grasses for camels grown in the UAE; but through this training course, I was able to learn about integrated farms in the UAE, which include forages, vegetables, fish, livestock, and poultry — all growing in one place."



During an open day for UAE-based farmers and agri-businesses, several farmers received awards for their work to take ICBA's research results to the field.

Raising awareness about UAE soils

Inaugurated in December 2016 with financial support from the Abu Dhabi Fund for Development (ADFD), the Emirates Soil Museum is a unique facility in the Gulf region which promotes environmental protection and soil conservation in the UAE and worldwide. Since its opening, it has grown into a knowledge hub for everyone who is interested in soils.

From December 2016 to December 2019, the museum attracted more than 4,000 visitors, including ministers, policymakers, researchers, farmers, and students from around the world.

Of this, 2,000 people visited the museum in 2019 alone, and about 1,700 of them participated in various workshops and special events highlighting the importance of soil and water resources for food security and sustainable agriculture.

Last year the museum also hosted several tree-planting events which were linked with the Year of Tolerance in the UAE and in which more than 600 trees such as Ghaf, Acacia, Ziziphus (Sidr), and Moringa were planted.

For example, on the occasion of the World Soil Day, the museum organized a two-day event featuring a series of arts exhibitions, workshops and tree-planting activities. Over 100 participants, including a large number of schoolchildren, took part in these activities.

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.”

Information and education provided by the museum plays an important role in highlighting threats to soil and engaging everyone to be advocates for actions that will protect the soils nationally and globally.



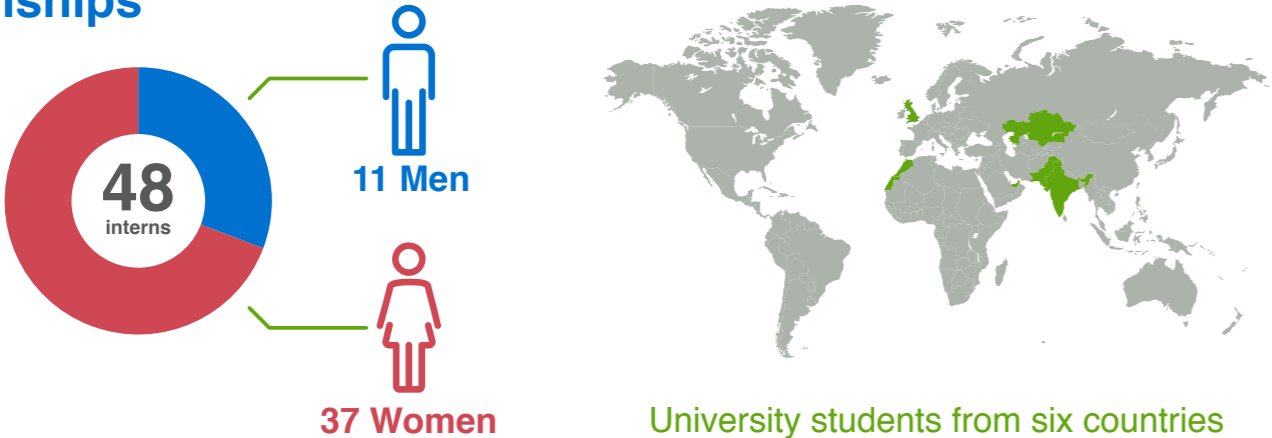
The Emirates Soil Museum is designed to promote awareness and knowledge about the threats to soils and the significant role healthy soils play in ensuring current and future global food security.

Building capacities

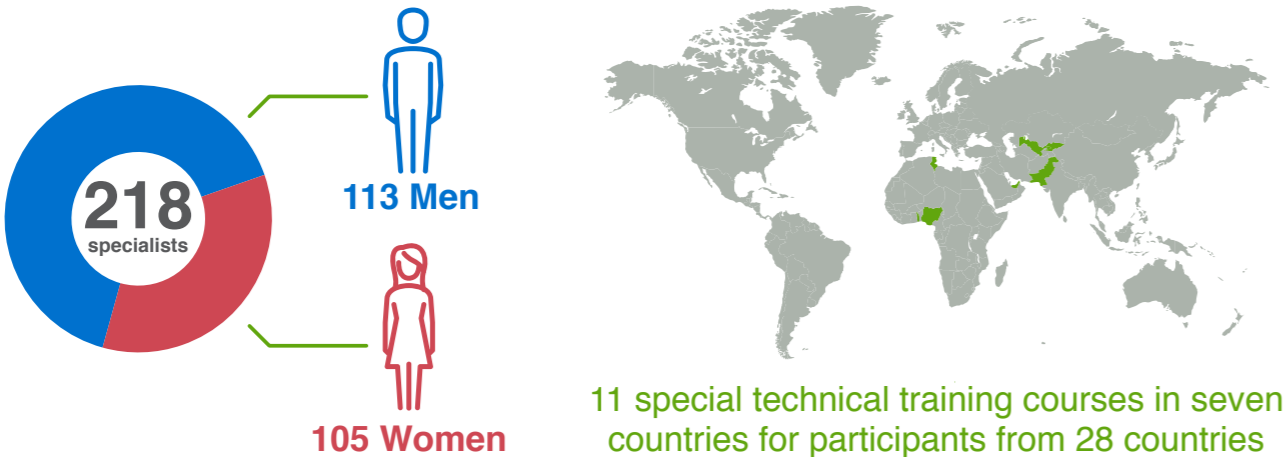
Capacity development is an integral part of ICBA's work. In 2019 our scientists focused considerable efforts and resources on identifying different stakeholders' capacity-building needs and catering to them.

They continued to work on strengthening 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



Special technical training courses



Communicating science-based knowledge



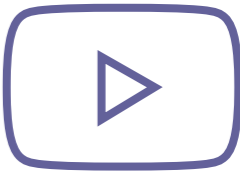
ICBA continued to communicate its science-based knowledge and research and development work to different audiences through the news media, its website and social media channels.



197
media mentions



150,285
website sessions



170,000
YouTube views

Knowledge products

Research publications

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 2019 our scientists produced a total of 34 research publications.

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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 (through the Food Security Office and the Environment Agency - Abu Dhabi) and the Islamic Development Bank. This funding helps ICBA continue to deliver on its mission and vision.

In 2019 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.

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- Arabian Gulf University
- Arab-German Young Academy of Sciences and Humanities
- Bill & Melinda Gates Foundation
- Center for International Forestry Research
- Council for Australian-Arab Relations
- Desert Control
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- Republican State Enterprise Kazvodkhoz
- Sergey Brin Family Foundation
- Swedish International Development Cooperation Agency
- Tottori Resource Recycling Middle East
- United States Agency for International Development

Financials



Statement of financial position

As at 31 December		
	2019	2018
	USD'000	USD'000
ASSETS		
Non-current assets		
Property and equipment	4,066	4,712
Right of use assets	98	-
	4,164	4,712
Current assets		
Inventories	56	27
Accounts receivables	954	1,922
Short-term deposits	13,620	14,710
Cash and cash equivalents	9,095	4,667
	23,725	21,326
Total assets	27,889	26,038
EQUITY AND LIABILITIES		
Equity		
Reserves – Designated	15,397	15,397
Reserves – Undesignated	2,762	2,678
Total equity	18,159	18,075
LIABILITIES		
Non-current liabilities		
Lease liability	64	-
Provision for employees' end of service benefits	484	383
	548	383
Current liabilities		
Lease liability	39	-
Accounts payables	6,423	5,941
Deferred income – restricted	2,720	1,639
	9,182	7,580
Total liabilities	9,730	7,963
Total equity and liabilities	27,889	26,038

Statement of activities and other comprehensive income

Year ended 31 December		
	2019	2018
	USD'000	USD'000
Grants income	10,929	10,549
Other income	34	20
Research and collaborator expenses	(8,750)	(7,773)
General and administration expenses	(2,464)	(2,401)
Operating (deficit)/surplus for the year	(251)	395
Finance income - net	337	244
Surplus for the year	86	639
Other comprehensive income	-	-
Total comprehensive income for the year	86	639

Board of directors



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Environment Agency -
Abu Dhabi (Chair)



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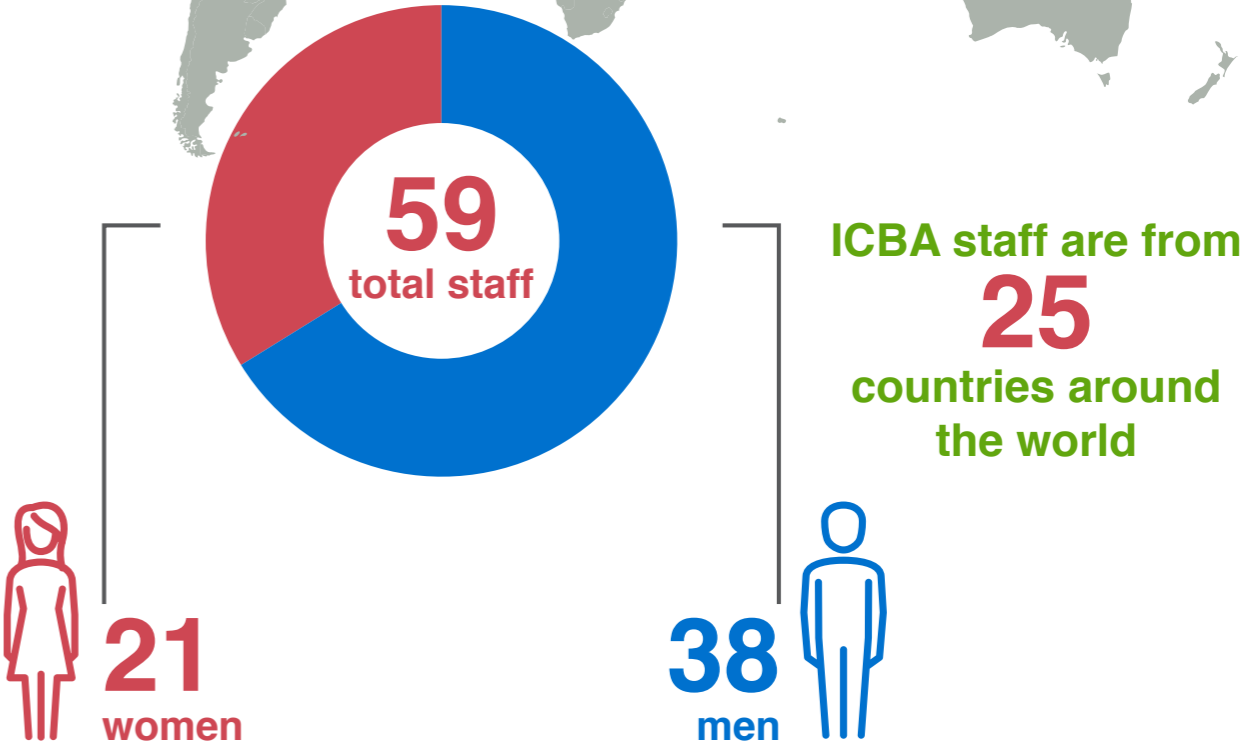
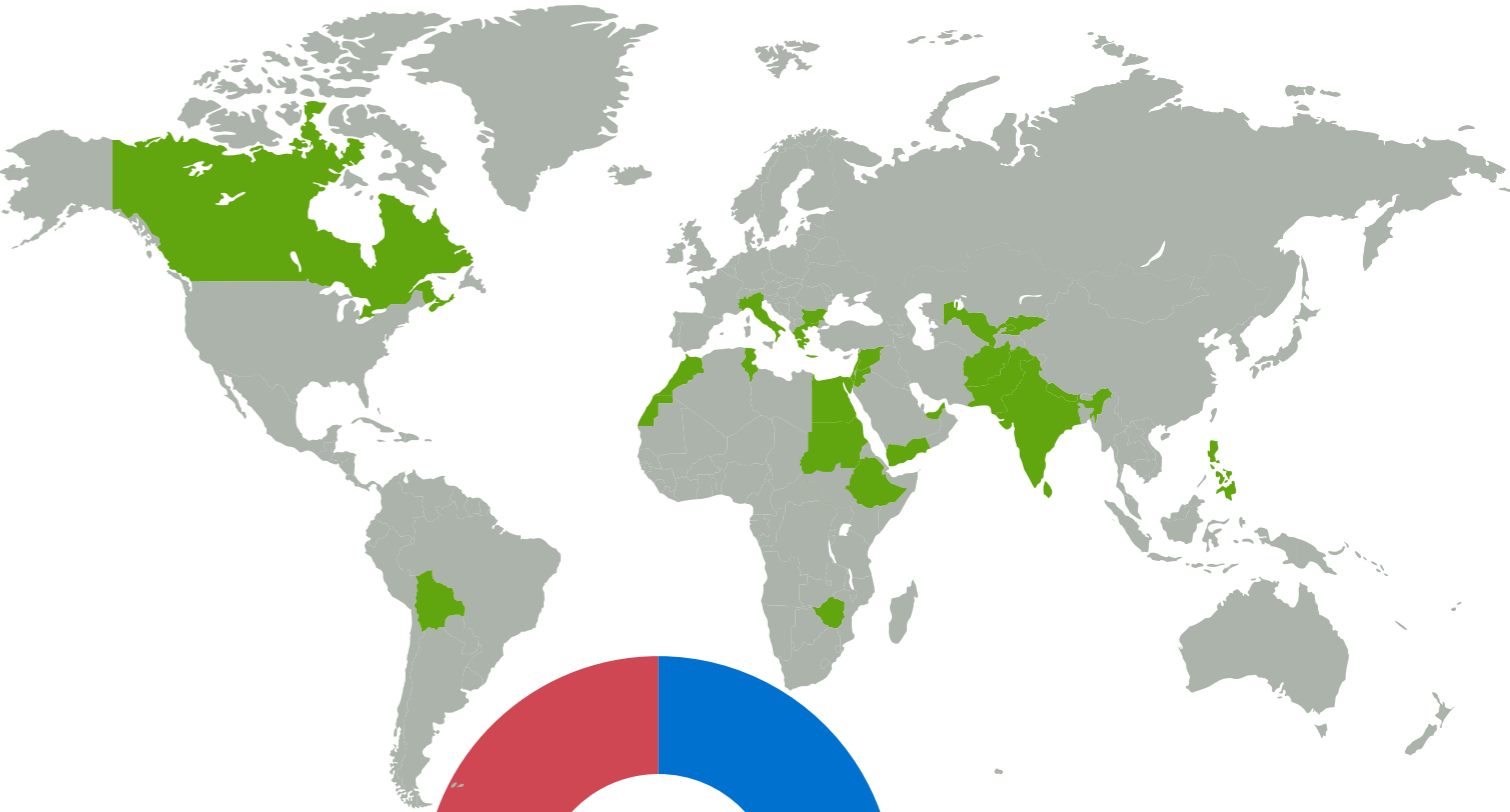


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