

International Center for Biosaline Agriculture (ICBA)

The **International Center for Biosaline Agriculture (ICBA)** – a not-for-profit, international center of excellence for applied research and development, established in Dubai in 1999 – identifies, develops and promotes innovative solutions and technologies that can increase food, nutrition and water security, improve the livelihoods of people and reduce degradation of natural resources in marginal environments, i.e. environments where natural resources are limited or have been degraded. ICBA's areas of focus include: assessment and sustainable management of natural resources, including conventional and non-conventional water sources; crop diversification and genetic improvement for sustainable production, with a particular focus on climate-smart, stress-resilient crops; integrated agri-aquaculture systems for food, feed and biofuel; climate change modelling and adaptation; capacity building of farming communities and national agricultural research and extension systems; policy analysis and formulation; and knowledge management. ICBA's work supports many countries around the world, including in the Middle East and North Africa, Sub-Saharan Africa, the Caucasus and Central Asia, and South and South East Asia. It contributes to several SDGs, including: No Poverty (SDG 1), Zero Hunger (SDG 2), Gender Equality (SDG 5), Clean Water and Sanitation (SDG 6), Climate Action (SDG 13), Life on Land (SDG 15) and Partnership for the Goals (SDG 17).

Established as an international organization by its founders, the United Arab Emirates (UAE) and the Islamic Development Bank (IsDB), ICBA has been categorized as a public international organization (PIO) by the United States Agency for international Development (USAID). The Center's projects have been funded by many prominent donors, among them the Arab Bank for Economic Development in Africa (BADEA), the Bill & Melinda Gates Foundation, the International Fund for Agricultural Development (IFAD), the OPEC Fund for International Development (OFID), the Swedish International Development Cooperation Agency (Sida), USAID and the World Bank, to name a few.

ICBA's corporate strategy, which was refreshed in 2018, aims to address the root causes of hunger, malnutrition and poverty by investing in smallholder farmers and contributing to each of the four pillars of food security:

- **Increasing availability of food:** ICBA believes that crop diversification is the key to ensuring global food security in the context of climate change. To this end, it is actively involved in the identification, introduction and facilitation of large-scale adaptation of stress-tolerant genotypes of conventional crops, such as sorghum, pearl millet and barley, as well as various alternative crops, such as quinoa, mustard, sesbania, safflower and triticale. The Center is the custodian of the world's largest collection of genetic resources of crops and forages suitable for salt-affected lands. ICBA also develops and promotes efficient and effective crop, soil and water management practices and technologies that enable farmers to optimize productivity while preserving the limited natural resources they have. Capacity building in biosaline approaches that enhance productivity is an integral part of ICBA's interventions; since its establishment in 1999, ICBA has trained more than 2,000 agricultural workers and farmers from around 75 countries, as well as provided numerous fellowship and internship opportunities to young professionals working in the field of agriculture.

- **Improving access to food:** ICBA complements the introduction of new crops with value chain development efforts that facilitate access to markets for smallholder farmers, as well as create new business and employment opportunities for rural communities in input supply, crop processing, value addition and marketing, particularly for women and young people. ICBA establishes linkages between the value chain actors, and builds their capacity in relevant skills and services to ensure the efficiency and long-term sustainability of the created value chains.
- **Improving nutritional adequacy of the food intake:** Promoting nutrition-sensitive food systems is an important component of ICBA's mandate. For example, to address macro and micro-nutrient deficiencies in marginal environments, ICBA and its partners are presently leading an initiative to introduce and scale up the production of quinoa in selected African and Asian countries with high rates of chronic malnutrition. Quinoa, which can thrive in extreme soil and climatic conditions, is one of the most nutritious food crops currently known. It is gluten-free, has a high content of crude proteins and more micronutrients than most staple grains, including wheat, rice and barley. ICBA is also developing and promoting integrated agri-aquaculture systems that can be sources of nutritious food, as well as sources of animal feed and biomass/seed for biofuel production.
- **Improving crisis prevention and management:** Droughts, a hazard that marginal environments are particularly vulnerable to, are likely to increase in severity, intensity, duration, extent and frequency. ICBA has been actively involved in building the capacity of national stakeholders in drought monitoring and efficient management, utilizing remote sensing, geographic information systems, and climate change modelling. ICBA has also been researching and developing a variety of climate change adaptation and mitigation solutions, including the aforementioned use of drought and salt-resilient crop varieties and alternative water sources for agricultural production. The Center develops and hosts several knowledge hubs to facilitate sustainable management and use of marginal resources for agricultural production and environmental protection in the context of climate change.

The initiatives that ICBA is currently spearheading include:

- **Promoting quinoa as a key to food, nutrition and income security in marginal environments:** Quinoa is an excellent choice for addressing food, nutrition and income-related issues, particularly in environments where conventional crops may no longer be able to thrive. Besides its use for human consumption, quinoa seed, stems and foliage can be used as livestock and poultry feed, while some of its components, such as oil, starch, saponin and colourings, may be used in the chemical, cosmetic and pharmaceutical industries. ICBA has launched a project to promote quinoa in Morocco, and planning to introduce and scale up its cultivation in a number of other countries with marginal environments and high levels of chronic malnutrition.
- **Promoting Salicornia as a food, fodder and biofuel crop for marginal environments:** To meet its growing energy demand and at the same curb greenhouse gas emissions, the world must transition from fossil fuels to renewable energy sources, including biofuel. In marginal environments that suffer from freshwater scarcity on the one hand and soil and water salinity on the other, there is an opportunity to grow halophytic (highly salt-tolerant) plants that both thrive in hostile saline conditions and have the potential to serve as a source of food, feed and biofuel.

Salicornia (*Salicornia bigelovii*) is a halophyte that can be used both as a vegetable and a forage, however its characteristics also make it a promising halophytic oilseed crop for biofuel production.

- **Promoting integrated aqua-agriculture production systems for climate change adaptation in marginal environments:** Climate change projections, including increases in temperature, decreases in precipitation, and more frequent and prolonged periods of drought, make it necessary to re-evaluate conventional agriculture and develop alternative approaches that put marginal land and water resources to good use. One such approach, which has the potential to enhance food, nutrition and livelihood security in hot and dry regions, is an integrated agri-aquaculture production system that combines as many of the following components as feasible in a particular target area: crops (conventional, non- conventional), livestock, and marine species (fish, shrimps, algae, etc.). In this multi-component farming system, the by-product of one component is used as an input for another component. It thus minimizes the use of external inputs and the effects of intensive farming, thereby decreasing the ecological footprint, while concurrently optimizing the use of available water resources through recycling and promoting biodiversity by enabling the production of a variety of crops and high crop yields.
- **Addressing growing soil salinity in sub-Saharan Africa:** ICBA is uniquely mandated to address the growing problem of soil and water salinity and its adverse impact on agriculture. Solutions that ICBA has developed and implemented include salt-tolerant varieties of crops and forages, soil and water management technologies that prevent further salinization, capacity building for farmers and agricultural workers in best agronomic management practices for saline areas, and related policy formulation. At present, ICBA is implementing a land rehabilitation project in Ethiopia, which stands first in Africa in the extent of salt-affected soils due to human-induced and natural causes. The *Rehabilitation and Management of Salt-affected Soils to Improve Agricultural Productivity* (RAMSAP) project, funded by the International Fund for Agricultural Development (IFAD), aims to enhance the productivity of 150,000 hectares of saline soils to an economically feasible level and minimize future salinity development, benefiting around 40,000 smallholder farmers and livestock owners in terms of increased incomes, improved food security and more resilient livelihoods. The Government of Ethiopia has requested ICBA to scale up the project to rehabilitate additional one million hectares.
- **Promoting safe use of treated wastewater for agricultural production in water-scarce countries:** Increasing water scarcity is one of the most critical challenges facing many countries in the Middle East and North Africa and other arid regions, driven by rapidly growing populations and increasing demands on freshwater resources as well as climate change impacts. The agricultural sector is particularly affected, with grave implications for the food security of these countries. As a result, reuse of treated wastewater for agricultural purposes is increasingly becoming a necessity for these countries. In recognition of this critical need, ICBA and Isle Utilities propose to establish and operate a Treated Wastewater Knowledge Hub in order to promote and facilitate safe use of recycled water for agricultural purposes, targeting water-scarce member states of the Organization of Islamic Cooperation. The knowledge hub will serve as an online encyclopedia on treated wastewater reuse, provide stakeholders in OIC member states with a knowledge exchange platform and facilitate networking among them, bring forward relevant technologies and innovative solutions that address their needs, and provide them with access to a robust

capacity building program and financing for further research on socio-economic, environmental and health impacts of treated wastewater reuse for agricultural purposes.

- **Enhancing drought management and climate change adaptation:** ICBA is the lead center in the region for climate change modelling and adaptation, and has an ongoing collaboration with the US National Drought Mitigation Center in drought research. It has introduced empowered drought management to stakeholders in Morocco, Tunisia, Jordan, and Lebanon through the USAID-funded Middle East and North Africa Regional Drought Management System (MENA-RDMS) project. In partnership with the Regional Office of the Near East and North Africa of the Food and Agriculture Organizations of the United Nations (FAO-RNE) and the Global Water Partnership Mediterranean (GWP-Med), ICBA aims to implement a project that will further enhance drought management and resilience capabilities in North Africa. The proposed project is centered on facilitating collaboration and cooperation among the countries in drought management and response, capitalizing on drought insight, experiences, technologies and planning solutions that are already being used or developed in the region and beyond. In addition to the direct benefits of effective drought management, it aims to reduce the impacts droughts have on vulnerable and marginalized rural communities whose ability to absorb the effects are limited, resulting in suffering, loss of livelihoods, possible unrest and migration.
- **Promoting dialogue and cooperation among riparian countries:** The Sustainable Development Goal 6.5 stipulates that by 2030 countries should implement integrated water resource management at all levels, including through transboundary cooperation as appropriate. This requires riparian countries to jointly manage water in an efficient, equitable and sustainable manner, noting that disparities and inequalities among them in this regard can threaten peace, security and sustainable regional growth. The Euphrates and Tigris river basin faces critical challenges, ranging from poor water governance to long-term climate change-induced risks. The absence of a regional institutional structure and open access database limits opportunities for the concerned riparian countries to lead a dialogue on shared water management. ICBA's CPET provides a rigorous evidence base that enables stakeholders in Iraq, Syria and Turkey to evaluate transboundary impacts, identify a range of water management options and develop a regional investment program. Thematic priority areas include hydrology and climate change, hydropower, water quality, agricultural water productivity, marshlands, and socioeconomics. CPET stakeholders expressed their wish to continue working together under the CPET framework beyond 2018 through a follow-on program that will focus on capacity building, development of new tools and optimal water allocation plans.
- **Equipping women scientists in the Middle East and North Africa (MENA) region with leadership skills:** ICBA believes that by creating the space and opportunity for women agricultural scientists in the MENA region to learn and work together, their individual and collective impact on food security challenges of the region, the economic and social wellbeing of local communities, and advancement of regional scientific research and development can be amplified. To this end, ICBA initiated in 2016 the Arab Women Leaders in Agriculture – AWLA – a capacity building program dedicated to Arab women scientists and researchers, and focused on building both their leadership and science skills in the agriculture field in the MENA region; create a regional network

of Arab women researchers to facilitate networking, knowledge exchange and collaboration among them both within and across disciplines; link regional researchers with international counterparts by creating opportunities for attachments with international institutions, participation in regional and international conferences, and sharing of best practices and collaboration; and fostering gender perspectives in agricultural research in the region. Covering nine countries in the MENA region – United Arab Emirates, Jordan, Morocco, Oman, Egypt, Tunisia, Lebanon, Palestine and Algeria – AWLA is being launched in phases in order to ensure systematic and effective implementation.

ICBA firmly believes that the Sustainable Development Goals (SDGs) can only be fully achieved if challenges in marginal environments are overcome. Global food and nutrition security as well as poverty reduction are impossible unless the diverse needs of people living in such environments are addressed in a holistic and sustainable manner. Greater focus on marginal environments is also warranted by the fact that more and more regions are gradually becoming “marginal” as a result of degradation and depletion of natural resources driven, on the one hand, by the increasing population pressure and, on the other, by climate change.

The complex and interconnected challenges of poverty, food insecurity, poor nutrition, water scarcity and adverse climate change impacts in marginal environments can only be addressed through concerted and complementary efforts of a broad range of stakeholders. With this in mind, ICBA seeks to expand its network of partners, as well as to expand collaboration with existing partners in new areas of research and in different regions. Partners are selected on the basis of comparative advantages that add value to and generate synergies with ICBA’s research for development efforts.