

ICBA

STRATEGY:

Refresh 2019-2023



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ICBA

AGRICULTURE FOR TOMORROW



INTRODUCTION

Since its adoption in 2012, ICBA's Strategy 2013-2023 has been the guiding force behind the center's work. The strategy has been informing ICBA's research and development programming for the past six years. During this period, the strategy has proven an important tool for devising actions in response to the needs of a wide range of stakeholders in different regions. However, the global research and development landscape has considerably changed. A host of threats and opportunities arose, which required ICBA to carry out a mid-term review of the strategy and rethink the way forward for the center with a fresh look that capitalizes on the opportunities while mitigating the threats. A prime example of the opportunities is the adoption of the comprehensive United Nations Sustainable Development Goals (SDGs) in 2015, while dwindling funding for research and development is among the main challenges.

ICBA initiated the mid-term review of the strategy in January 2018 by forming different technical task forces. Each task force was charged with assessing the merits and shortcomings of the old strategy and recommending adjustments that account for the changes in the global research and development agenda. The mid-term review also presented an opportunity to reflect on the progress,

successes and challenges of different programs and activities that are based on the strategy. As part of this exercise, ICBA carried out extensive internal discussions, including a SWOT analysis, and external consultations to seek views from partners and collaborators. This work was also designed to partially lay the groundwork for a new forward-looking long-term strategy once the current strategy expires.

The output of this mid-term review is this refreshed strategy for the remaining period of 2019-2023, which is mostly aligned with its predecessor but also takes into account emerging fields like genomics and controlled-environment agriculture, including vertical farming, that hold great potential for future food, nutrition and water security in marginal environments. The refreshed strategy builds on ICBA's present comparative advantages and their relevance in the current research and development context. More importantly, the vision, objectives, research innovation themes and innovation enablers were specifically aligned with the Sustainable Development Agenda 2030 adopted by the international community as the global blueprint for future development. ICBA's refreshed strategy is directly linked with the SDGs and is geared towards contributing to the relevant goals.



FIGURE 1 STRATEGIC OBJECTIVES, MISSION AND VISION



ICBA'S COMPARATIVE ADVANTAGES

1. Extensive experience in developing tailor-made solutions to problems of salinity, water scarcity and drought
2. Unique long-running research and knowledge on salinity and water scarcity in marginal environments
3. One of the world's largest collections of germplasm of drought-, heat- and salt-tolerant plant species
4. Inter-disciplinary research teams and world-class research facilities
5. Unique focus on alternative rather than mainstream solutions and approaches

The refreshed strategy has a sharper focus and clearer goals. The main changes are as follows:

1. ICBA's vision statement was changed from an inward-looking version to an outward-looking one focused on sustainability and the center's vision for marginal environments;
2. ICBA's strategic outcomes and strategic objectives were revised and aligned with ICBA's mandate and SDGs;

3. The four research innovation themes were realigned to reflect internal and external factors;
4. The 5th 'Policies for Resilience' research innovation theme was recast as a cross-cutting theme that is embedded in all four research innovation themes;
5. Two innovation enablers were identified to support the research innovation themes based on the insights gained during the past five years of strategy implementation;
6. Sustainability was integrated as a keyword throughout the strategy.

As before, ICBA is committed to delivering on its mission and strategic objectives through attracting and retaining top talent from around the world.



FIGURE 2 WHERE ICBA WORKED IN 2017



To date ICBA has implemented research-for-development programs in more than 30 countries. The center continues to forge partnerships to work with stakeholders in new countries in line with its mission and vision.

OPPORTUNITIES AND THREATS

There are a number of external factors that may affect to varying degrees the implementation of this refreshed strategy. These factors include the opportunities that ICBA

needs to take advantage of and the threats that need to be addressed. The refreshed strategy is informed by these factors.

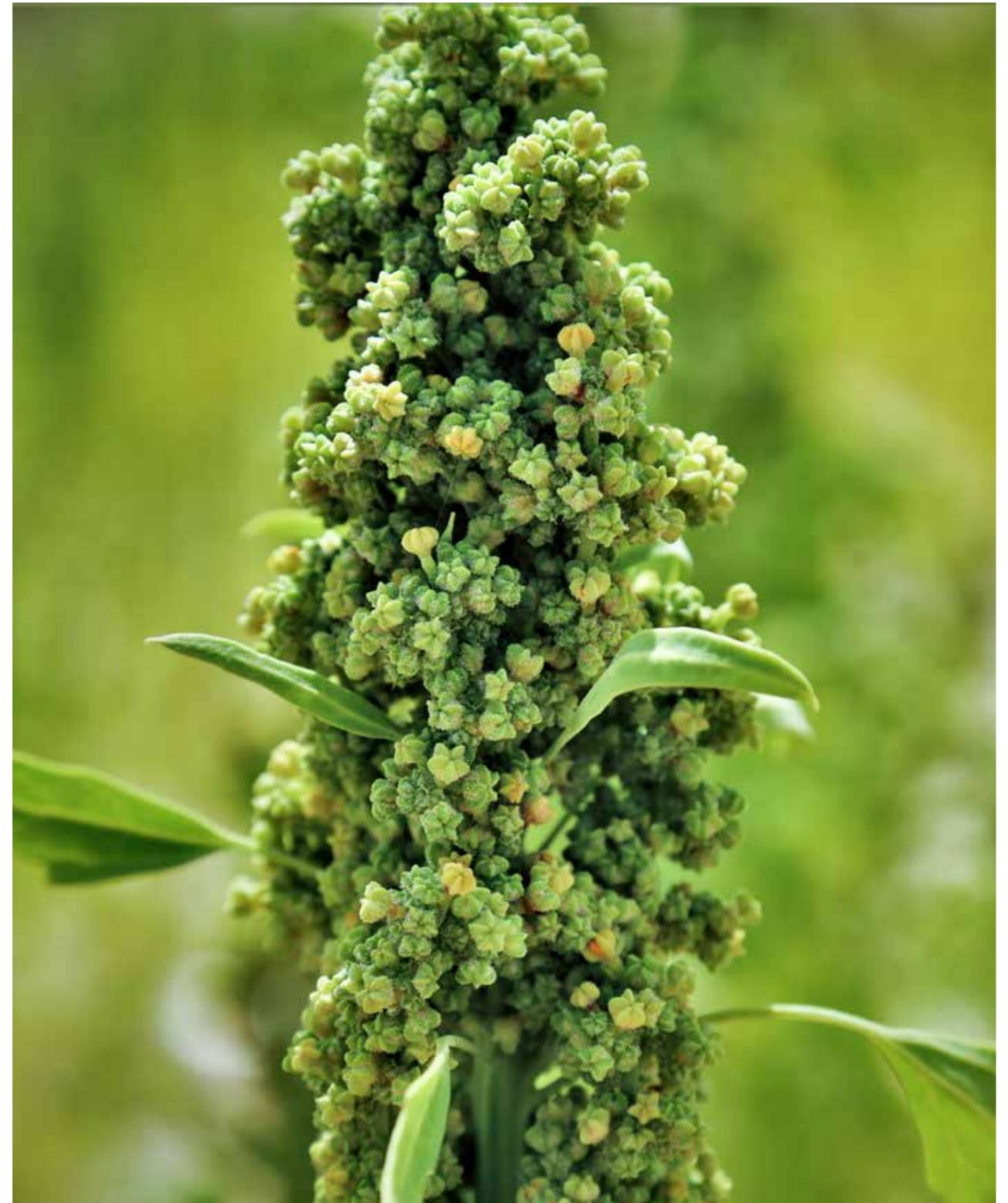


FIGURE 3 OPPORTUNITIES

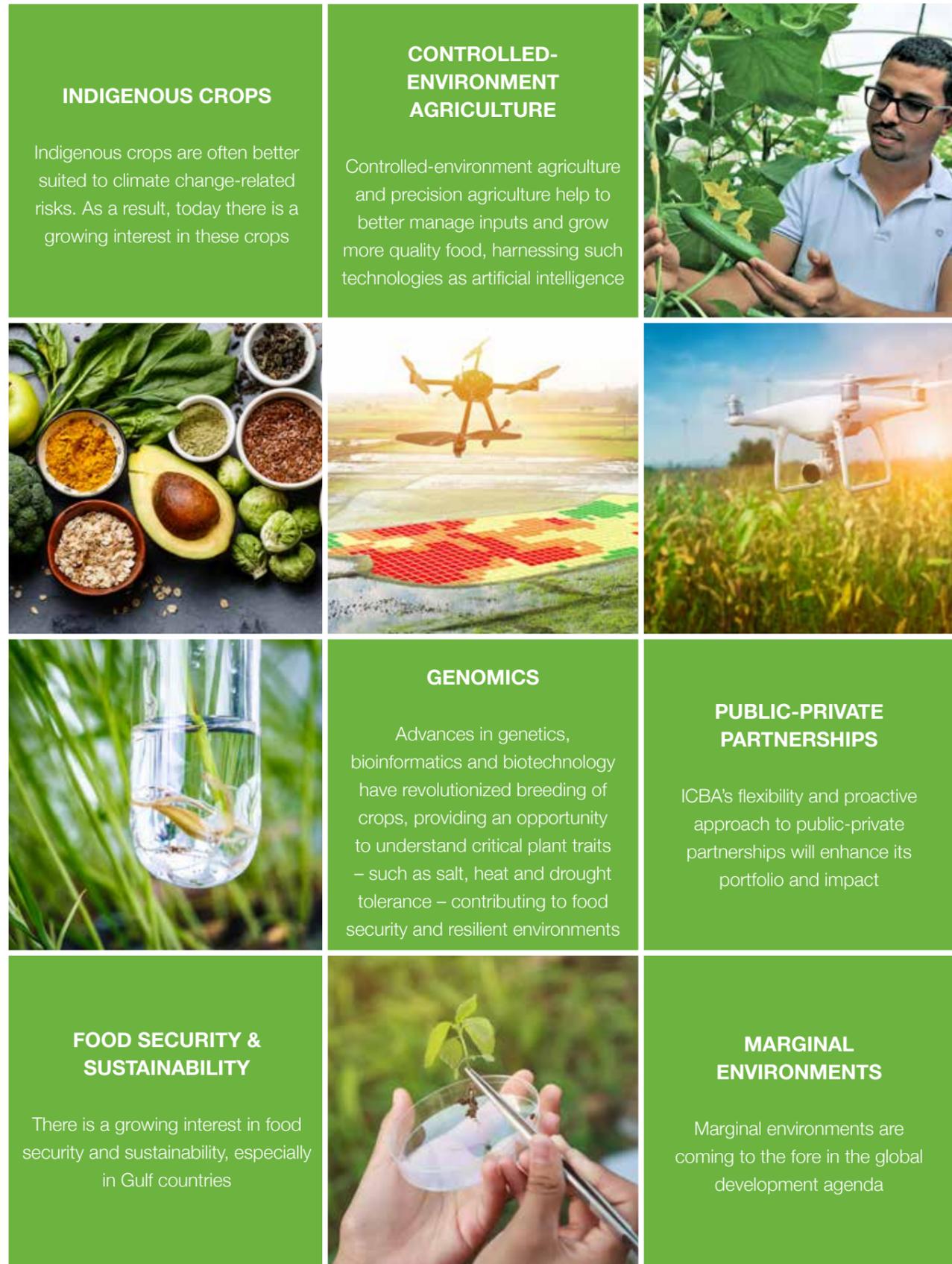
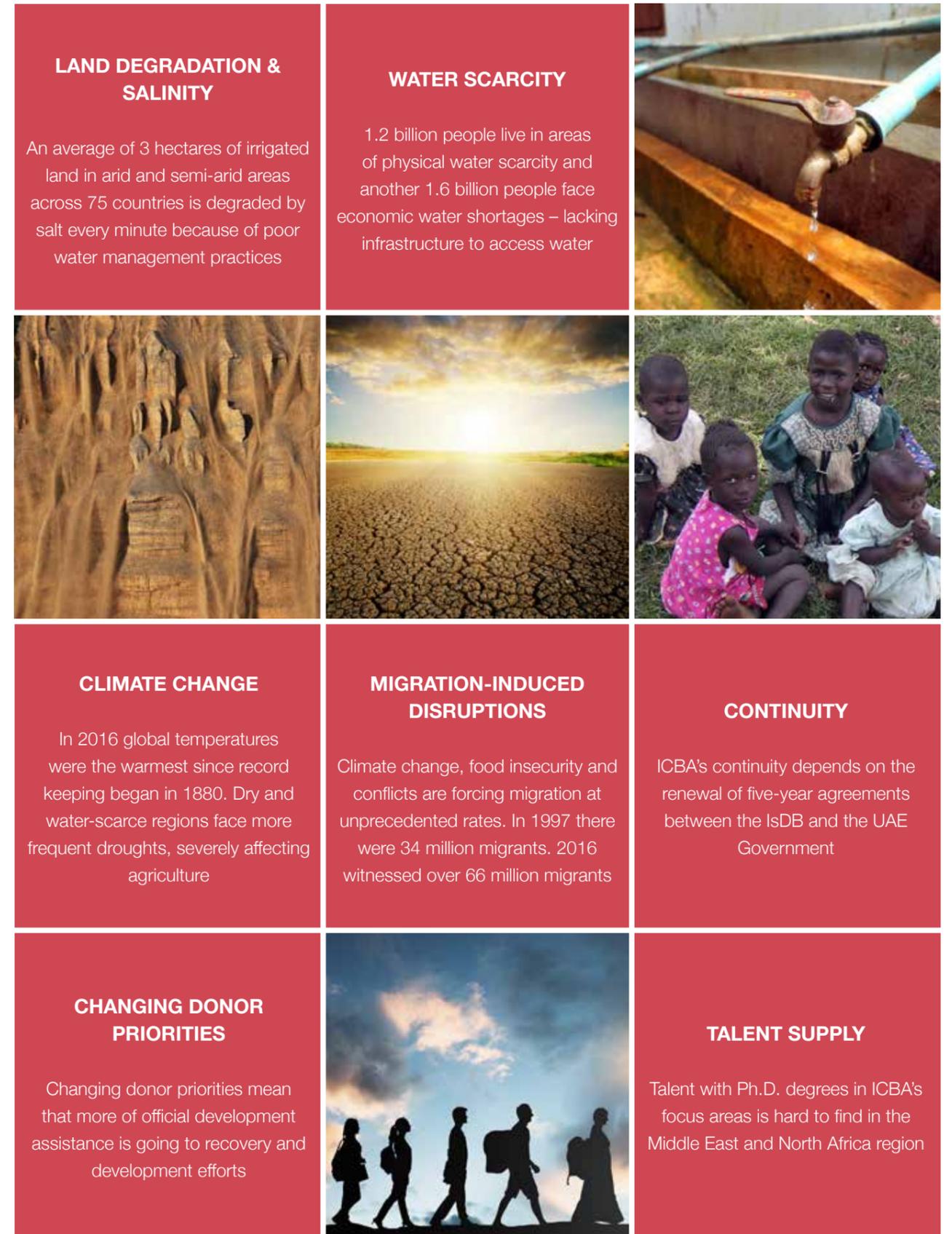


FIGURE 4 THREATS

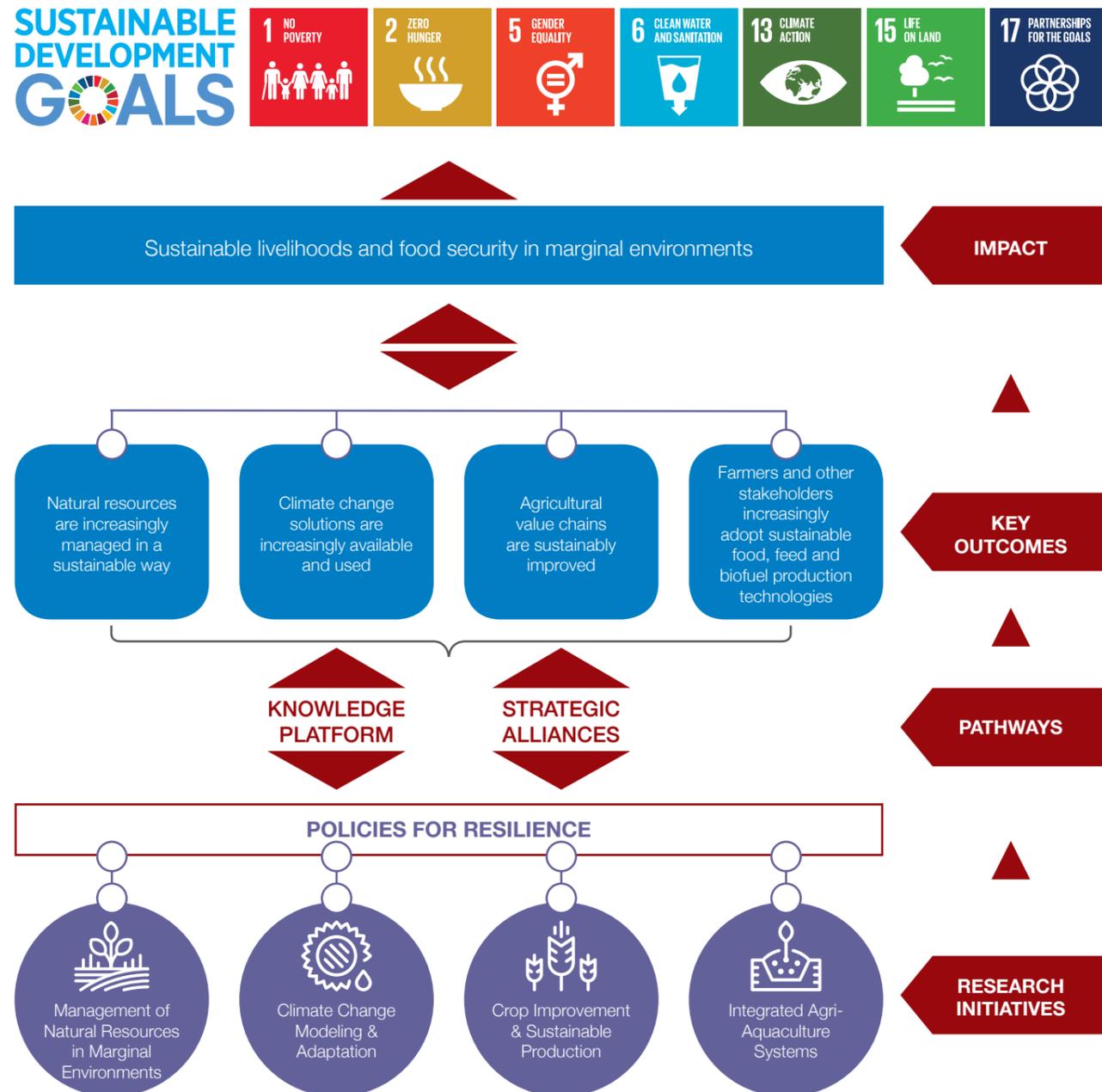


HIGH-LEVEL THEORY OF CHANGE FRAMEWORK

As part of the refreshed strategy, ICBA also mapped out how its work will achieve outcomes, impacts and ultimately contribute to the SDGs. The center identified causal links between research innovation themes and innovation enablers, the key outcomes, impacts and the SDGs. For the purposes of the refreshed strategy, a high-

level theory of change framework was developed. This framework describes how ICBA's initiatives under the four research innovation themes will be channeled through the two innovation enablers to reach the key outcomes, impacts and thus support the SDGs on a global level.

FIGURE 5 HIGH-LEVEL THEORY OF CHANGE FRAMEWORK: 2019-2023



MARGINAL ENVIRONMENTS

Marginal environments are some of the most vulnerable areas in the world. They are affected by biophysical and socioeconomic constraints.

Biophysical:

- Soil constraints (texture, low fertility, poor drainage, shallowness, salinity, sodicity)
- Water constraints (saline water, insufficient water: access, quality and quantity)
- Landscape constraints (steep terrain etc.)
- Unfavorable climatic conditions (low precipitation etc.)

Socioeconomic:

- Absence of or difficult access to markets
- Restrictive land tenure, smallholdings
- Poor infrastructure
- Unfavorable input/output ratios
- Limited role of rural women in decision-making

and medium-income economies. The competing demands for freshwater resources for agriculture, energy and human consumption are set to intensify. Agriculture already accounts for 70% of the total global freshwater withdrawals, making it the largest user of water.

In this context, it is crucial that these complex interactions are better understood and managed, and there is more effort at every level of natural resources management to ensure long-term sustainability, food, nutrition, energy and water security in marginal regions.

ICBA will continue to focus efforts on sustainable management of natural resources like fresh water and efficient use of alternative water resources for agriculture such as treated wastewater, drainage water, produced water, and different types of saline water, including reject brine and sea water. Priority will also be given to improving irrigation efficiency and agricultural water productivity through modeling, water accounting and other tools as a means of responding to water scarcity in marginal environments. A new area of focus will be air-to-water technology. The center will also conduct applied research on precision agriculture, irrigation efficiency, water accounting and agricultural water productivity, remote sensing and GIS applications, surface and groundwater modeling to determine water balance and agricultural production at different levels (from farm to basin). ICBA will work to scale up sustainable irrigation systems, including small-scale irrigation solutions, tailored to local environments in target countries. Subject to feasibility, these systems will draw on automation and artificial intelligence.

RESEARCH INNOVATION THEMES

1 MANAGEMENT OF NATURAL RESOURCES IN MARGINAL ENVIRONMENTS

In marginal environments, natural resources are more limited and fragile than anywhere else. Yet climate change and population growth, among other factors, are putting additional pressure on vital resources like fresh water, undermining food, nutrition and water security of the communities that live there. Around 40% of the global agricultural lands are marginal considering only aridity and slope and 65% of the population of lower-income countries, or 1.7 billion people, live in marginal conditions, including 70% of the extremely poor. Another problem is land degradation, including soil fertility decline and salinization, which is impacting agriculture, the main source of livelihood for rural communities, causing considerable social and economic damage.

Complicating this situation is the fact that there are complex interactions between the water, energy and food sectors, also known as the water-energy-food nexus, which are projected to experience acute shortages in many of the low-

The center will also work on reducing land degradation and restoring degraded lands. This work will include assessment of existing cropping systems in marginal environments, and development of profitable and sustainable crop production systems for degraded lands. In collaboration with its partners, ICBA will design applied research to determine best soil, water and nutrient management practices to rehabilitate degraded lands and thus increase food production in marginal environments. As part of this work, the center will continue long-running research on soil improvement through organic and inorganic amendments and crop production using low-quality water like treated wastewater and saline water.

ICBA will also continue to provide technical assistance to national and regional initiatives on land use, agro-climatic zoning, and reclamation and use of marginal lands. This will include technical backstopping – monitoring, supervising and evaluating – for development banks and institutions on

agriculture in general and land management in particular. environments.

The center will also support its country partners in developing policies and strategies on sustainable water and land management, as well as food, nutrition and water security in marginal environments, and help to build local knowledge and capacity in the process. ICBA will continue to draw on a wealth of its past experience and knowledge to inform policy work and make it available in the form of policy documents.

This work aims to contribute to more efficient and sustainable management of natural resources in marginal environments through appropriate practices and technologies. The goal is to increase agricultural productivity and thus improve food, nutrition and water security and livelihoods of communities living in these environments.

2 CLIMATE CHANGE MODELING AND ADAPTATION

In many parts of the world, climate change is making, among other things, precipitation less frequent and weather hotter. This is particularly true of marginal environments, which already suffer from a lot of other constraints on agriculture. As a result, crop production is declining, and in some cases failing. In these regions, additional climate change-induced stresses can cause further disruptions to existing fragile systems. Therefore, predicting the nature and extent of likely impacts in these areas is key to developing mitigation and adaptation measures to help offset the impacts and make water and agricultural systems more climate-resilient and sustainable.

ICBA will draw on multi-disciplinary solutions that combine scientific advances in various areas to devise effective measures for climate change mitigation and adaptation. The center will continue to establish itself as a one-stop shop for climate change-related knowledge and support for governments, businesses and communities in marginal

In partnership with NASA, the University of Oxford, American and European research groups, ICBA will also continue to build on its advanced modeling work that harnesses the advantages of big data and machine learning to generate data on the likely conditions in the near and medium term.

This work will also involve modeling and remote sensing tools to identify areas of the greatest climate change impact.

Future analysis and planning to address the potential impacts will continue using water and crop modeling and studying future climate change conditions, where the computer acts as a test bed for possible technology, crop management and policy options. This information will then be used along with ICBA's field-tested practices to plan climate-smart agricultural and water systems to adjust to the future.

One area of continuing focus will be that of studying and analyzing extreme events such as droughts and heat waves. In many of the countries where ICBA works, droughts cause some of the biggest impacts. The center's ongoing activities focused on the three pillars of integrated drought management – monitoring/early warning systems, vulnerability and impact assessment, mitigation and response – will help to ensure enhanced risk management and adaptation.

ICBA's work in this area will help countries and businesses adjust to a changing climate. The overall goal of the work is to enhance livelihoods, adaptive capacities and incomes of agricultural communities most vulnerable to the impacts. The identification of vulnerable areas will help target investment and policy support so that communities are supported in managing the effects. Helping smallholder farmers, particularly women, adjust and adopt new practices will ensure rural livelihoods are maintained and improved.

3 CROP IMPROVEMENT AND SUSTAINABLE PRODUCTION

As the world population is forecast to reach 9.7 billion by 2050, agriculture and food production will need to undergo significant changes to meet the increased demand. It is necessary to diversify crops that form the cornerstone of modern food security, especially in marginal environments. Current dependence on a few major crops, which are highly vulnerable to climate change effects, will seriously undermine future food security. Therefore, crop diversification, that is use of underutilized crops, should be an integral part of sustainable food production in marginal environments in a changing climate.

Furthermore, most of future biofuel should come from crops like Salicornia (food/feed/biofuel) or other crops that can be produced in degraded and marginal areas utilizing marginal resources like saline water and seawater. This is particularly important in view of the global food crisis of 2006-2008 caused by an international drive for biofuels derived from corn and other major crops. This approach will help to save scarce freshwater resources and make non-traditional crops the focus of biofuel production.

ICBA will expand its research on climate-smart crops to achieve food and nutrition security in marginal environments. This will include introducing new genotypes of nutritious and stress-tolerant crops.

Research will focus on breeding new high-yielding varieties of different crops that are tolerant of salinity, drought and heat and are suitable for food, feed and biofuel production. Specifically, the center will work on food crops such as quinoa and pearl millet, annual and perennial forage crops like sorghum and barley and multi-purpose crops like Salicornia (food/feed/biofuel), among others.

ICBA will also give fresh impetus to its global program on quinoa to speed up further research, testing and adoption in target countries. Having identified five quinoa lines through years of research and experimentation, the center has a vast amount of practical experience and there are already many cases of successful adoption in countries in the Middle East, North Africa and Central Asia. Future efforts will focus more on seed production, harvesting and post-harvest technologies.

In collaboration with its partners, ICBA will continue to develop new resilient and nutritious varieties of these crops by combining genetic and genomic approaches, while also strengthening partners' capacity in seed production. The center will also continue to share sustainable management practices and technologies that are economically affordable, technically feasible, and relevant to smallholder farmers in marginal environments.

Progress on this front will be made in parallel with collaborative efforts to develop value chains for these crops in target countries. This work will aim to facilitate faster take-up among smallholder farmers, especially women, and link them with markets.

VERTICAL FARMING IN DESERT ENVIRONMENTS

ICBA will pursue development and introduction of different controlled-environment agriculture systems, namely vertical farming technologies in desert environments. Vertical farms are among the most promising solutions to boost food, water and nutrition security in challenging environments as they help to grow different types of crops by using highly efficient designs and precision agriculture methods.

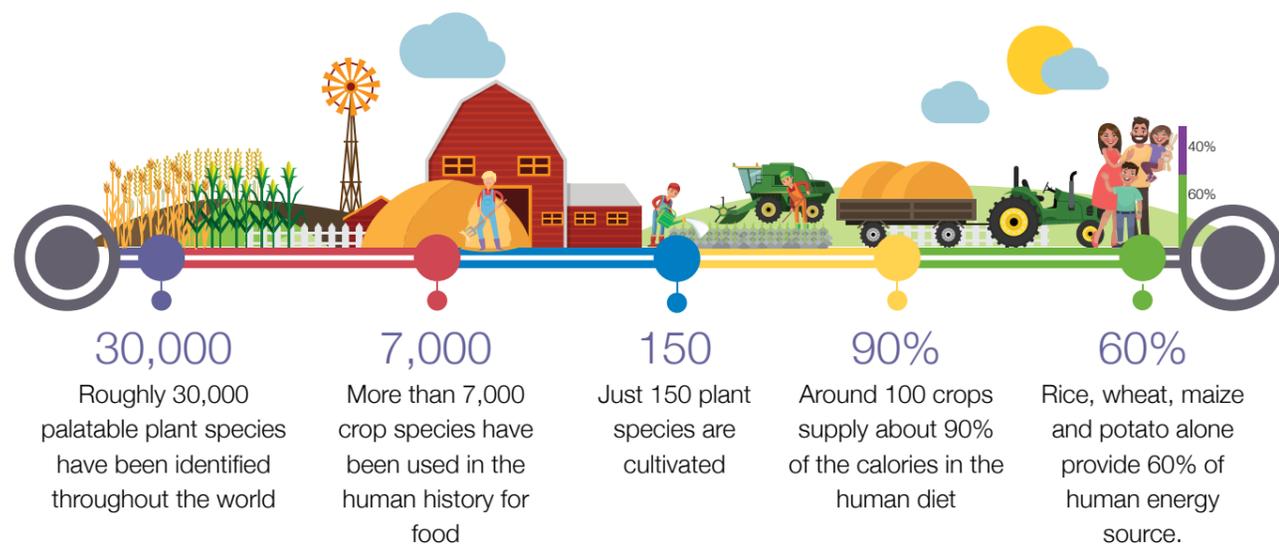
The center will also continue to collect, conserve and utilize plant genetic resources from marginal and other environments in its gene bank.

Controlled-environment agriculture, including vertical farming, will also be an area of focus. This work will aim to improve resource efficiency in marginal conditions.

The center will also support its national partners in developing relevant policies and strategic plans to ensure sustainable crop production and improve food and nutrition security in marginal environments.

This work will contribute to sustainable food production in a changing climate in marginal environments. It will be aimed at increasing adaptive capacities, livelihoods and food security of smallholder farmers and rural communities.

FIGURE 6 CROP DIVERSITY VS. MAJOR CROPS



4 INTEGRATED AGRI-AQUACULTURE SYSTEMS

To meet future food demand in marginal environments, it is important to develop integrated agri-aquaculture systems. Inland and coastal farms that combine cultivation of a variety of crops with livestock and fish production present an opportunity to maximize productivity. They make better use of available resources while preserving ecosystems prone to environmental degradation. Integrated farms are more suited to addressing challenges like climate change and water scarcity. Combining agriculture and aquaculture is one way to boost food production and ensure sustainability in resource-scarce regions. These systems are among the best sustainable agriculture models suitable for marginal areas for food, feed and biofuel production, generating multiple incomes for rural communities. They make it possible to grow high-value crops, halophytes, domesticated animals and aquatic species in a synergistic way using low-quality water and land resources such as saline groundwater, reject brine from desalination, drainage water, and salt-affected lands.

ICBA will continue research on the sustainability aspect of inland and seawater-based integrated agri-aquaculture farms. In this regard, the center will continue economic

analysis of these farms and facilitate the development of value chains for halophytes and other produce from these farms to encourage take-up among smallholder farmers and secure policy and other support from governments.

ICBA will also focus on improving the waste management such as composting fish waste and livestock manure, exploring more uses of alternative crops and contributing to scaling-up programs.

ICBA will expand its work on agroforestry systems integrating more non-traditional crops for forage and biofuel production.

ICBA will collaborate with partners to explore the potential of growing algae in integrated farms for biofuel and other uses, and ways to incorporate renewable energy.

The center will also work on policies and regulations to promote safe use of low-quality water resources and the proper implementation of integrated agri-aquaculture farms.

This work will support national and international efforts with the goal to increase food and nutrition security in marginal environments by bringing all available degraded land and water resources into use. This will help to reduce environmental footprint, increase incomes of farming communities and improve their adaptive capacities to climate change.

INNOVATION ENABLERS

1 STRATEGIC ALLIANCES

Producing sustainable impact on grave issues relating to food and water security is not possible without a strong commitment to partnerships, collaboration and cooperation. To that extent, ICBA is committed to delivering on its vision, mission and its contributions towards the fulfillment of an array of SDGs through building focused strategic alliances and partnerships at different levels, and in varying arenas. Special attention will be paid to partnerships with national agricultural research systems, financial and development organizations, research-focused institutions, and national policymakers.

At the country level, ICBA will work with, among others, national agricultural research systems to share knowledge and technology, while building individual and institutional capacity. ICBA will support all countries which share the problems that define marginal environments, face similar challenges and pursue similar development goals. This support will be aimed at helping them to enhance food, nutrition and water security, and improve natural resources management, environmental conservation and adaptation to climate change. The center will also step up its research and development efforts in the countries in the Middle East, North Africa, sub-Saharan Africa, Central Asia, the Caucasus, South and South-East Asia where it has already implemented successful programs. ICBA will also continue to provide technical and other relevant assistance to partner ministries and government agencies in the United Arab Emirates, its host country and main funder.

The center will continue to build on its existing relationships with regional and international financial and development institutions and forge new ones to mobilize resources for research-for-development initiatives in marginal environments. It will continue to raise awareness about the significance of marginal environments, advocating for support for efforts that address food insecurity, water scarcity and poverty in regions with such environments, and emphasizing that the SDGs can only be fully achieved if these challenges are overcome. ICBA will also seek to

ICBA AND BGI PARTNER TO ESTABLISH DESERT LIFE SCIENCES CENTER

In collaboration with BGI, the world's largest genomics organization, ICBA has established the Desert Life Sciences Center in the UAE with the support of the UAE Food Security Ministry. This new initiative will include advanced genomic research on stress-tolerant and climate-resilient crops, with a particular focus on desert plants and neglected underutilized species from marginal environments.

establish more multipartite agreements with international financial bodies to increase the scope, reach and impact of research-for-development initiatives. Concurrently, ICBA will continue to expand its knowledge base and capacities to cement its position as a center of excellence and a partner of choice for development efforts targeting marginal environments, working closely with its strategic partners to design and implement interventions that bring about positive and sustainable change.

ICBA will also seek to expand its network of partners, as well as to increase collaboration with various partners in current and new areas of research, both upstream and downstream, and in different regions. Partners will be selected on the basis of comparative advantages that add value to and generate synergies with ICBA's research-for-development efforts. The center will work more closely with NASA, the University of Oxford, as well as research groups and institutions in the US, Europe and elsewhere. ICBA will also step up collaboration with CGIAR and AIRCA centers whose efforts complement its portfolio. The center will strengthen its strategic partnerships with such centers as ICRISAT, IWMI, ICARDA, ILRI and IFRPI, among many others, to offer more synergistic solutions to its stakeholders.

Part of this expansion will include the private sector, in particular agri-businesses, and national and international civil society organizations as vehicles for scaling up its research outputs. Special attention will be given to partnerships at the grassroots level with farmers' organizations, women's cooperatives and associations of young people whose livelihoods depend on the limited resource base of marginal environments and who are

thus the primary stakeholders of ICBA's innovations that address food, water and income security.

As policies for resilience are an integral part of ICBA's work, the center will continue to support national policymakers with evidence-based recommendations and solutions. ICBA will continue to work towards facilitating in-country policies conducive to adoption of best practices, crops and technologies among different stakeholders.

ICBA's work will help in bridging the gap between research and practice, as well as facilitating the adaptation of existing best practices and innovative technologies, and the generation and application of new ideas. Of most significance would be ICBA's ability to create a community of practice specializing in the promotion of food, water and income security in marginal environments. These synergetic partnerships will help to create a circle of knowledge transfer that translates into capacity building at all levels.

2 KNOWLEDGE PLATFORM

One of the main outputs of ICBA's work is knowledge. The center is committed to creating and sharing this knowledge with its stakeholders - from smallholder farmers to policymakers - through a variety of means.

ICBA will continue to work on establishing itself as a center of excellence for knowledge creation and dissemination in the global research and development arena. As an applied research-for-development center, ICBA will serve as a platform for creating and sharing high-quality science-based knowledge that meets the requirements and needs of its stakeholders, ensuring that this knowledge is packaged appropriately for each audience.

ICBA aims to produce and package knowledge in different forms and formats, including research papers, policy briefs and communications and training materials. Each knowledge product will be tailored to the requirements and needs of a specific target group. Knowledge generated through research will also be informed by indigenous knowledge, that is knowledge owned and created by communities that are the focus of development interventions. ICBA is committed to the principle of science-based knowledge as a global public good. Its efforts will revolve and be centered around this idea. In this regard, ICBA will strive to make all knowledge it creates available to everyone at no cost.

The main tools of knowledge dissemination will include capacity development, technology platforms, knowledge hubs and communications.

Capacity development will remain one of the central pillars of knowledge and technology transfer. ICBA will work with partners to strengthen individual and institutional

capacities of all stakeholders. To this end, the center will cooperate with donor agencies, research institutions, the private sector and academic institutions to offer a wide range of capacity-building opportunities such as:

- Fellowships and internships
- Short- and mid-term training programs
- Farmer Field Schools

ICBA will also work to develop knowledge hubs, that is web-based repositories of specialized knowledge, to facilitate knowledge and technology transfer and decision-making. These knowledge hubs will aim to address knowledge gaps and meet information requirements of a wide range of stakeholders, specifically about technologies and solutions promoted by ICBA and its partners.

Communications will also be one of the mainstays of knowledge-sharing. ICBA will continue to employ a broad set of communications tools to ensure its research and development results reach all stakeholders, and there is growing awareness about the challenges facing people living in marginal environments. This work will involve, among other things, turning research output into communications products tailored to each category of stakeholders, and distributing these products through different means, including social media and the media.

The center will also facilitate transfer of successful knowledge, best practice and technology among countries which share similar environmental, agricultural and other challenges. This will be achieved through, among other

things, communities of practice and partnerships which will support cross-country collaboration.

This work will contribute to empowering a wide range of stakeholders to deal with challenges to food, water and nutrition security in marginal environments. It will also help to create a shared and deeper understanding of these challenges at different levels and inform collective strategies to address them.

DELIVERING AGRICULTURE AND WATER SCARCITY SOLUTIONS IN MARGINAL ENVIRONMENTS

ICBA will remain responsive to emerging issues while addressing the main challenges of food and water security in marginal environments by drawing on its multidisciplinary staff, established relationships with regional and national stakeholders, quality research, knowledge management and capacity-building initiatives. The center will contribute to the relevant SDGs through its research innovation themes. Guided by this refreshed strategy, ICBA will also continue its work of providing evidence-based policy recommendations to combat emerging threats to food and water security in marginal environments.





ABOUT ICBA

ICBA is a unique applied agricultural research center in the world with a focus on marginal areas 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. Through its work, ICBA helps to improve food security and livelihoods for some of the poorest rural communities around the world.

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