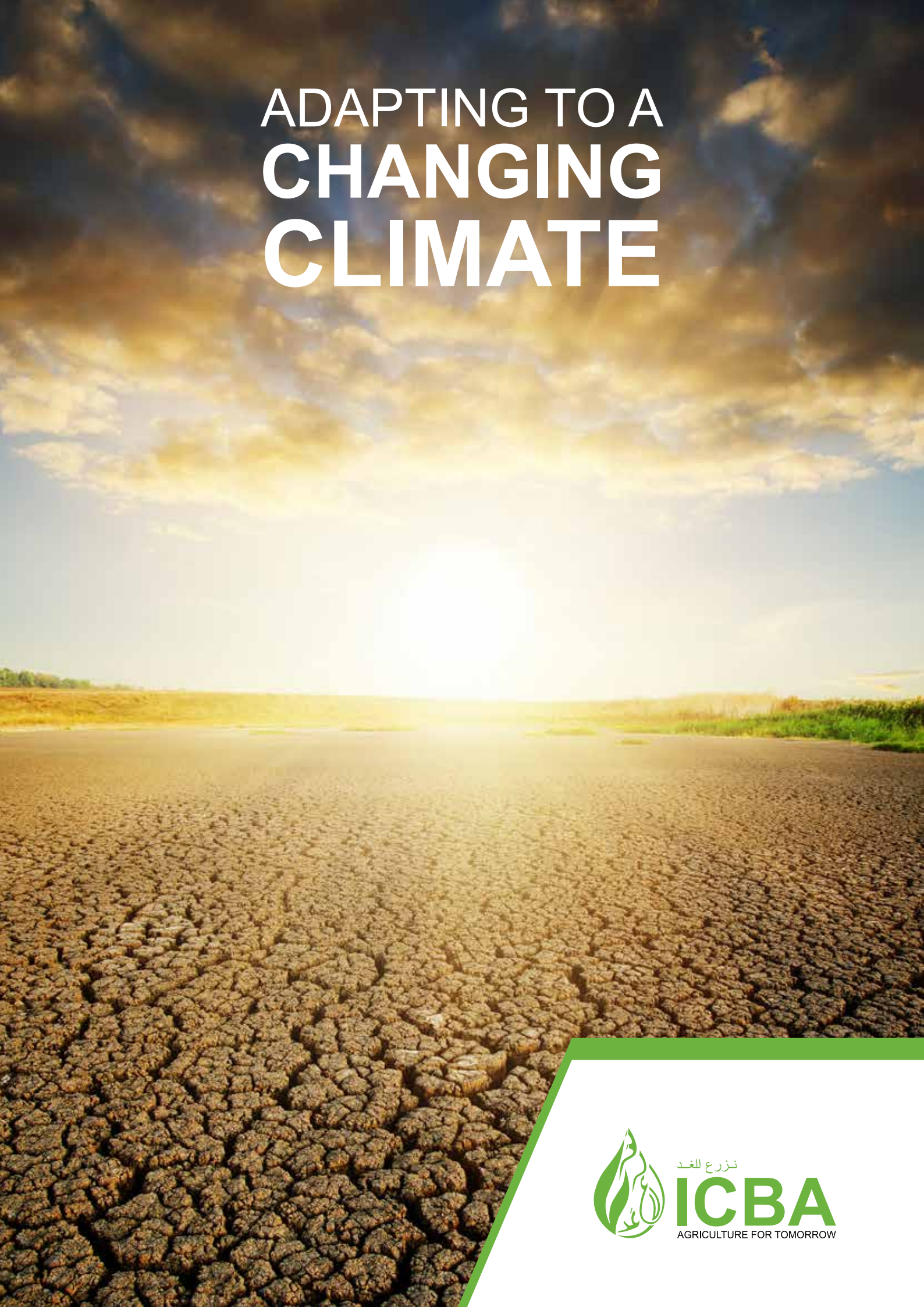

ADAPTING TO A CHANGING CLIMATE

نزرع للغد
ICBA
AGRICULTURE FOR TOMORROW

OVERVIEW

Changing climate, weather extremes and associated water stresses increasingly dominate news headlines and global risk reports. Whilst researchers and activists have outlined for more than a decade the likely impacts, it has been the devastating weather extremes and the costs on people and economies that have focused attention in the last few years. In the World Economic Forum's 2016 Global Risk Report, failure of climate change mitigation and adaption, and water crises, were among the top five most important risks. In the 2017 Global Risks Interconnections, changing climate was ranked second in the top five trends that determine global developments. It ranked as a top trend for 2017, with all five environmental risks in the survey such as extreme weather events, natural disasters, failure of climate change mitigation and adaptation, biodiversity loss and ecosystem collapse, and man-made environmental disasters, featuring for the first time among both high-risk and high-likelihood, with extreme weather events emerging as the single most prominent global risk.

Today, research for development needs to focus on how best to adapt to these new climate conditions. It is often the most vulnerable with the least resilience that are most affected. Water availability for both human use and crops is one of the first felt impacts, threatening both water and food security for many millions. Responses are needed that integrate climate science, crop and water management innovations, with policy and institutional developments. The work at the International Center for Biosaline Agriculture (ICBA) over the last two decades can bring important insight, experience and knowledge to address the increasing challenges of climate change.

CLIMATE CHANGE: ICBA'S AREA OF FOCUS FOR TWO DECADES

The development of climate change adaptation strategies, supporting evidence and innovation is especially important in marginal environments where the impact of climate change is likely to be significant. In the coming years and decades, the changing climate is expected to exacerbate the problems of lack of fresh water, drought, low rainfall, extreme temperatures etc. leading to increasing challenges for future food and nutrition security.

Key objectives of work on climate change at ICBA are:

a. Determine and quantify the likely impacts of future climate conditions on water resources and agricultural systems to support decision-makers in developing adaptation strategies, management and investment plans and policies;
b. Develop adaptation and mitigation plans for vulnerable regions to improve access to water and ensure food security;
c. Develop climate-smart technology packages focused on improved water management and development of salt- and drought-tolerant crops for food, fodder, fuel and fiber that can be used as part of adaptation plans.

ICBA CLIMATE MODELING

As climate averages and extremes are expected to impact agricultural and water systems, it is first important to understand the likely new nature and characteristics of key variables such as rainfall and temperature. Shifts in timings, shortening of the growing season and increasing dryness can all have a big impact on crop growth and yields. Changes in extremes – heat waves and drought in particular – can be particularly damaging, so variability in likely intensity and frequency needs to be identified. For a number of regions including the Middle East and North Africa (MENA), data from the major predictive Global Climate Models (GCMs) have highlighted the future increases in temperatures, decreases in rainfall and increases in extreme events, particularly drought.

In this regard a key activity at ICBA has been climate change modeling which identifies the changes at more local levels. Global data sets have been transformed into regional and national scale information which has helped identify within these areas where the changes in climate are going to have the greatest effects.

By identifying the most vulnerable areas first, efforts can be focused on the people and agricultural and water management activities there to develop adaptation solutions.

In each of these areas, different aspects of the climate having the greatest impact have been identified. In some it was the increasing aridity, in others it was the increase in summer day/night temperatures, whilst in others still it was the reduction in cold winter spells. By understanding these changes, new crops and varieties can be tested and introduced along with innovative ideas for managing irrigation to support the systems. The new regional and national scale climate data were then used in water and crop models to help identify the impacts on key staples and important resource systems. By experimenting in the modeling with different crop species and water and agricultural management practices, ideas on how to offset the impacts of climate change were explored. These formed the basis of practical solutions for climate-smart agriculture and water management plans.

MANAGING CLIMATE EXTREMES: A FOCUS ON DROUGHT

A particular area of climate change that is identified as causing potential great impact is drought. Prolonged periods without rainfall are a threat to food and water security bringing unwanted additional pressures on natural resources, impacting economic and social development. Unfortunately, for many parts of the MENA region, climate change modeling undertaken by ICBA has shown a likely increase in drought frequency and intensity.

The effects of recent shocks reveal the gaps and limitations in drought management in the region. Drought conditions in Morocco and Tunisia in 2016, and the southern Levant in 2014 emphasize the urgent need to support the governments and people of these countries in developing multi-level policies/ programs to manage the impacts of these extreme events.

ICBA has been working with the international experts, the United States Drought Mitigation Center at the University of Nebraska - Lincoln, alongside the United Nations Food and Agriculture Organization (FAO) and national partners to bring the latest findings on drought management to the MENA region. The approach harnesses innovations in information technology alongside policy and practical water and crop solutions to help mitigate the impacts of these extreme events. The aim is to build resilience at the household through to the country level, to help withstand the effects of these climate shocks.

Quinoa's great adaptability to climate variability and its efficient use of water make it an excellent candidate for climate change adaptation programs. Certain quinoa varieties can grow under extreme environmental conditions as they are drought- and salt-tolerant.

ADAPTATION SOLUTIONS IN WATER, CROPPING AND POLICY IDEAS

Pearl millet is also well suited to regions which are already affected by salinity, heat and drought or are likely to be due to climate change.

Governments, businesses and citizens will need to be supported in adaptation planning with new innovations in technology, policy and information to bring about the required changes in behavior and practices. The work of ICBA scientists in natural resources management and crop diversification provides important insight for decision-makers, where the scientists targeted the improvement of livelihood and productivity, resiliency to climate change and income of poor farmers relying on marginal water and land resources. This was achieved through scaling-up and disseminating high-yielding forage/crop production packages better adapted to the marginal environmental conditions. It was possible to identify climate-resilient crop varieties and accessions that tolerate the marginal and saline conditions, climate change impact and other factors restricting productivity which was a key step in the development of integrated alternative or modified agricultural systems in marginal environments.

Nearly 8,000 accessions of more than 20 forage species were screened and evaluated to identify genotypes with better stress tolerance and productivity under marginal conditions. Integrated field management for seed production enhancement was developed which included three main parts: soil management, irrigation and drainage management and forage crop field management. Yield enhancement by this integrated approach exceeded 40% in many cases.

Changes in water availability will lead to increased water allocation stresses. So adaptation measures that bring increased efficiency are particularly important. Better irrigation scheduling and management of quantities used is an area that can bring much-needed water saving. Through sensors linked to satellite images and modeling, scientists at ICBA show how agribusinesses and small-scale farmers can save water and energy in the cropping systems. Different irrigation technologies that can help save water in water-scarce regions are being identified and tested for large-scale adaptation. Other work on using non-conventional water as part of the water resources system is also giving important insight on alternatives to be supported in adaptation planning.

There are also important innovations in developing and testing different crops that can be grown in increasingly dry or saline conditions as a result of a changing climate. By working with local national agricultural research systems (NARS), the various options for crop species can be tested and then linked to economic modeling; social surveys and developments in seed production systems can be scaled up to support climate change adaptation planning.

ECONOMIC CAPABILITIES

Climate extremes such as drought could mean a big hole in the countries' treasuries as it can cost millions of dollars and even more to those countries, with poor planning or lack of drought preparedness. ICBA has been assisting several national research centers and governments in climate change adaptation and mitigation and the scientists from the center have implemented operational drought management systems in several countries of the MENA region, where the local players are trained to generate their own real-time drought maps. This not only helps policy-makers to manage the impact of droughts in the shortest possible time, but also helps them to have a clear idea about the requirement of resources, by analyzing the severity and topographies of drought.

In addition to its work on climate change modeling and adaptation, ICBA has also identified and developed several climate-smart innovations like energy-efficient net-houses, integrated aqua-agriculture systems, climate-resilient crops such as quinoa, sorghum and barley, which can withstand climate extremes and high salinity. The center's work on climate change is in line with the Paris Agreement, which calls for ambitious efforts to fight climate change and adapt to its effects. Under its mandate, the center is fully committed to working towards the Sustainable Development Goals (SDGs), particularly SDGs 1 and 2 on poverty and hunger, as well as SDGs 6, 13, 15 and 17. The SDGs call for new, integrated approaches to tackling global problems such as poverty, hunger and climate change.

Sesbania is another plant that is resistant to heat and salinity. It is used as fodder.

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.

For more information, please contact us at:

PO Box 14660, Dubai, United Arab Emirates
+971 4 336 1100
+971 4 336 1155
icba@biosaline.org.ae
www.biosaline.org

ICBAAgriculture