Sida's Helpdesk for Environment and Climate Change

SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES

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Biosaline agriculture

Middle East and North Africa

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Sida's Helpdesk for Environment and Climate Change is a government agency collaboration between the Swedish University of Agricultural Sciences (SLU), University of Gothenburg (GU) and Sida to promote enhanced integration of environmental issues and perspectives in Swedish development cooperation.

Executive summary

The purpose of this study was to provide information on biosaline agriculture and its opportunities and challenges, with particular attention to the Middle East and North Africa (MENA) region and people living in poverty. The study was commissioned by Ola Möller, Environmental Advisor / Senior Policy Specialist, MENA region.

Salinization has become a major **environmental and socioeconomic issue** globally and is aggravated by the impact of climate change. The consequences for food security of the build-up of soil salinity have gained widespread attention, and recently (in 2018), soil salinization was assessed. It particularly affects arid and semi-arid regions, such as the MENA region.

Salinization is caused by high salt content in parent materials or groundwater, low precipitation, high evaporation rates, and poor water logging. It is closely associated with unsustainable agricultural practices, including various irrigation methods.

In response to the challenges of salinization, biosaline agriculture has been gradually emerging as an innovative approach both globally and in the MENA countries. It is a broad term used to describe agriculture under a range of salinity levels in water resources, soils, or both. In this report, approaches and techniques are grouped into: i) irrigation and soil management;
ii) use of non-traditional water resources (brackish water, seawater, and wastewater);
iii) cultivation of salt-tolerant plants (crops); iv) application of techniques for salt-sensitive plants;
v) biotechnology; and vi) integrated techniques in aquaculture and, partly, agroforestry.

For example, halophytes (salt-tolerant plants) can be grown without competing for agricultural land and freshwater resources, while also promoting livestock production (e.g. as fodder), which benefits poor farmers. Biosaline agriculture can generate **a range of advantages**, such as:

- Reducing pressure on good-quality water and land resources
- Utilising wastelands (barren or uncultivated land) and poor-quality water resources
- Providing new sources of food, feed, biofuels, and fibre
- Generating employment, particularly for youth and women
- Reducing labour intensity while improving productivity and income
- Contributing to climate change mitigation through rehabilitation of degraded lands and CO_2 sequestration
- Supporting climate change adaptation by improving community resilience
- Increasing biodiversity and ecosystem services
- Strengthening rural livelihoods

The MENA region has three main agricultural systems: irrigated crop-based, rainfed mixed, and livestock-based systems. Countries share similar challenges with salinization alongside other problems, though many challenges are also site-specific. Context analyses are provided for **Syria, Iraq, Iran, Palestine, Jordan, Lebanon, Yemen, Egypt, Tunisia, Morocco, Libya**, and **Algeria**. Overall, biosaline agriculture is predominantly **a long-term approach**, and investments in the agricultural

sector in the MENA region have been low in recent years. Political instability, war, and other disasters have significantly affected rural areas and the sector.

There is a continuous need to identify and assess the most affected or vulnerable areas in the region, and to promote practices that enable sustainable adaptation of agricultural production. Depending on the type of biosaline agriculture, it can provide options for poor populations in areas where agriculture is the primary source of income but is declining due to salinity, water scarcity, and drought—especially where conventional interventions have not yielded positive or lasting results. To effectively reach **the poorest and most vulnerable groups** and generate positive impacts, **it is essential to understand poverty through a multidimensional lens in the specific context**.

Experiences with biosaline agriculture (in practice, research, and, to some extent, policy) from **Egypt**, **Tunisia**, **Morocco**, **Iran**, **Saudi Arabia**, **the United Arab Emirates (UAE)**, and **Syria** are presented. For example, in Syria, it has been demonstrated that saline groundwater mixed with river water from irrigation canals of the Euphrates can be used to grow crops, mainly barley, cultivated for animal feed. Certain genotypes of quinoa and pearl millet, which are non-traditional crops in the region, have also been successfully cultivated in areas affected by salinity and drought.

Managing salt-affected areas is not the responsibility of individual farmers alone but requires collective action and effective institutional arrangements. While farmer associations are rare in the MENA region, there are exceptions in Tunisia, Egypt, and Morocco.

The report further summarises **challenges and priorities for biosaline agriculture in the region with issues highlighted for Sida´s consideration, including** capacity development, holistic/systematic approaches, natural resource management (particularly water resources), sustainability (nature-positive and risk-averse strategies), extension services, support to research-policy-practice linkage), value chain development, infrastructure enhancement, and enhanced cooperation across MENA countries. Overall, financial resources remain severely limited for sustainable agricultural systems in the region.

Key actors addressing salinization challenges in the MENA region include national universities and global/regional research centres such as the International Center for Biosaline Agriculture (ICBA), the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), and the International Center for Agricultural Research in the Dry Areas (ICARDA). Regional and global networks include the Arab Network for Biosaline Agriculture (ANBA), the Sahara and Sahel Observatory (OSS), the Inter-Islamic Network for Biosaline Agriculture, the International Network of Salt-Affected Soils (INSAS), the Knowledge Cluster in Agriculture for Salinising Deltas, the Global Soil Laboratory Network (GLOSOLAN), and the Global Framework for Action to Cope with Water Scarcity in Agriculture in the Context of Climate Change (commonly known as the Global Framework on Water Scarcity in Agriculture, WASAG).

The **international financial support** for biosaline agriculture in the region has not been fully assessed in this study, but observations on major donor governments are provided.

Acknowledgements

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Cover photo: Biosaline agriculture, farm named "The 7th of April" (a political milestone), Deir Ezzor Governorate, Syria. Photo: Omran Alshihabi, SLU, 2002.