



Food and Agriculture
Organization of the
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هيئة البيئة - أبوظبي
Environment Agency - ABU DHABI

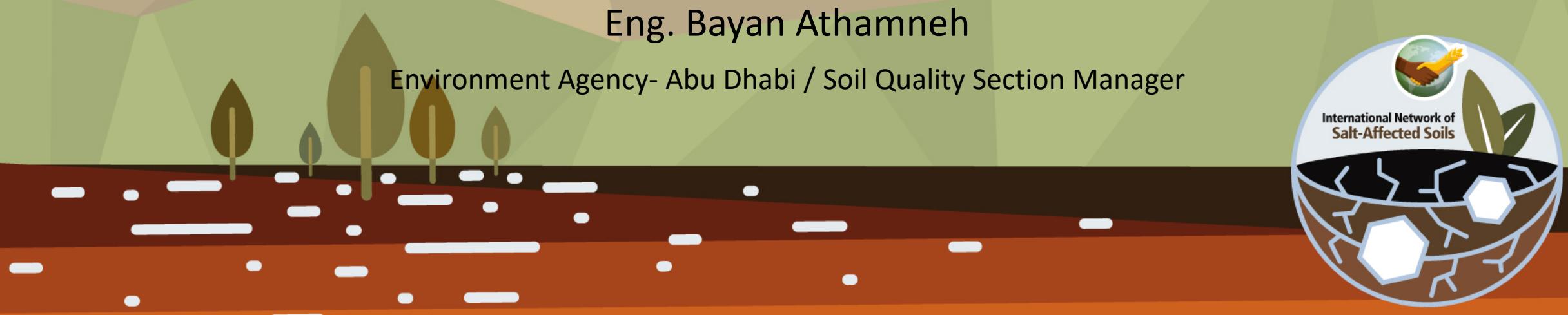
1st Meeting of the **International Network of Salt-Affected Soils** (INSAS)

SALT-AFFECTED SOILS MANAGEMENT

Soil salinity management plan of the United Arab Emirates

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SOIL SALINITY SURVEY PROJECT

hyper-arid climate condition (Low precipitation and high temperature), saline ground water cause one of the biggest challenges in agricultural land in the emirate: **Soil salinization**

Project objectives:

1. Assess the levels of salinity in agricultural soil;
2. Periodic monitoring to understand the seasonal changes in soil salinity
3. Develop a soil salinity management plan in agricultural land
4. Determine KPIs to measure the performance of the plan in managing soil salinity in agricultural land.

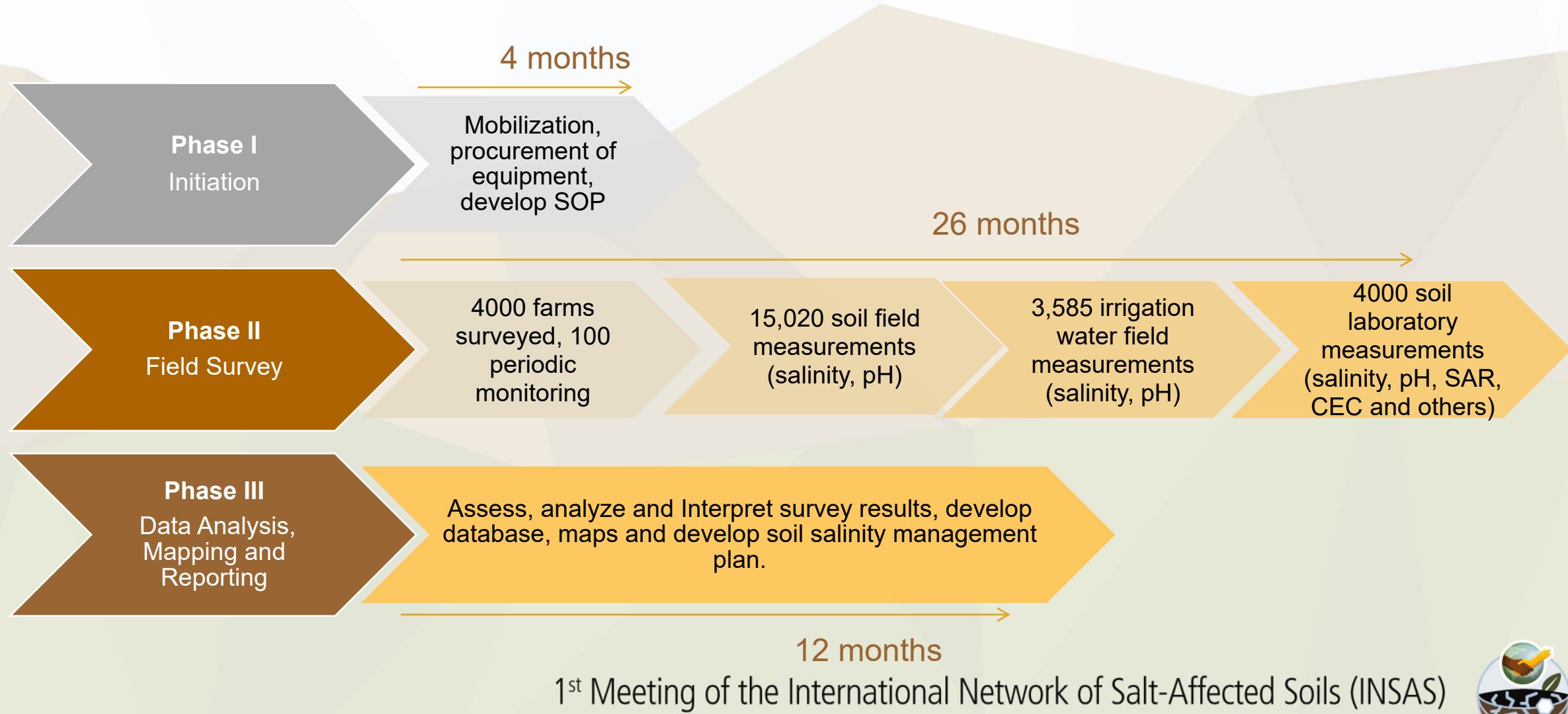


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SOIL SALINITY SURVEY - THE PROJECT PHASES

This project started in late 2016 and ran until end of 2018



On-site Farm Soil Analysis

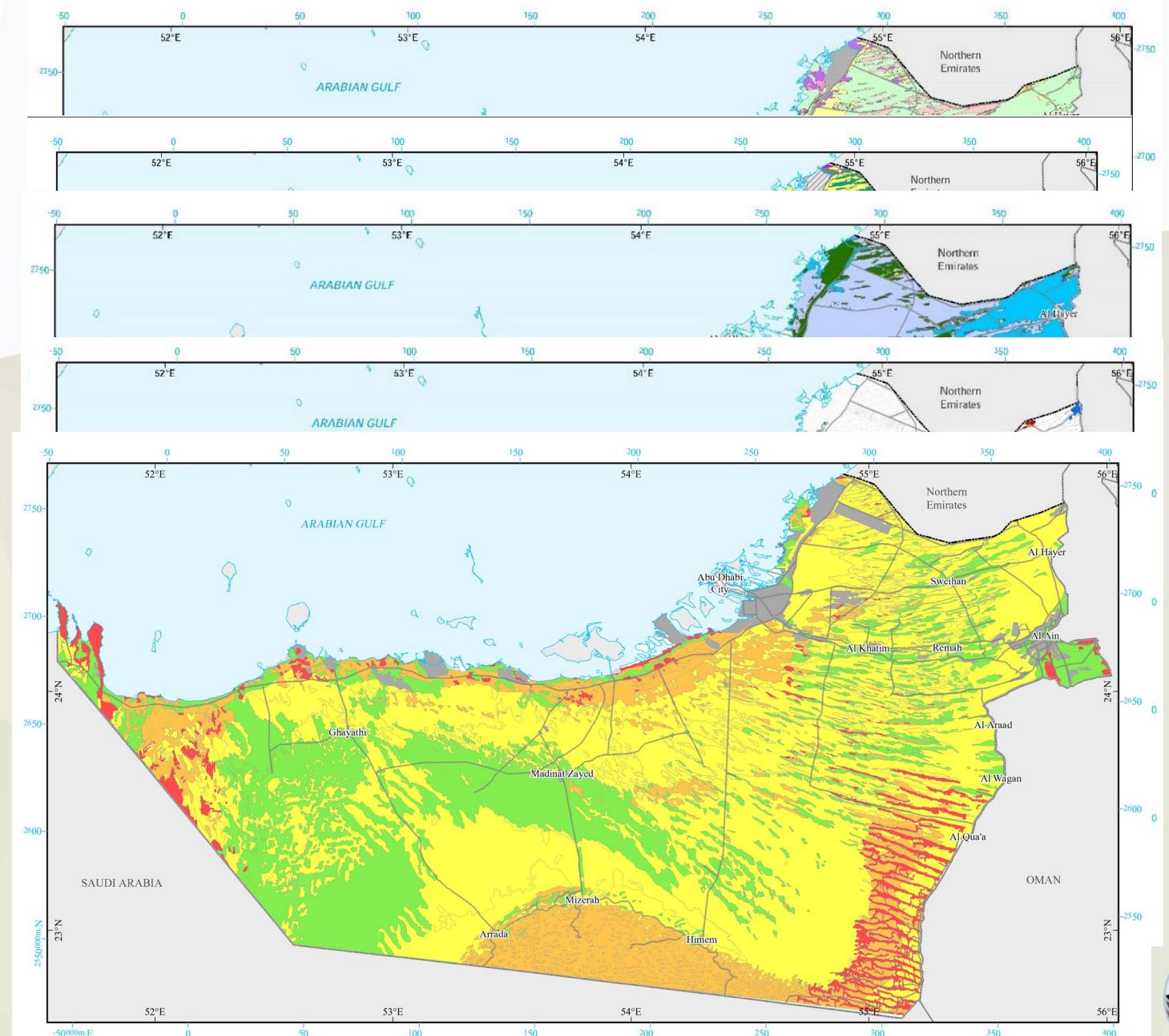
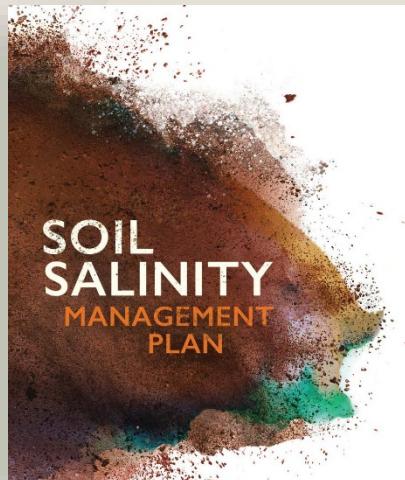
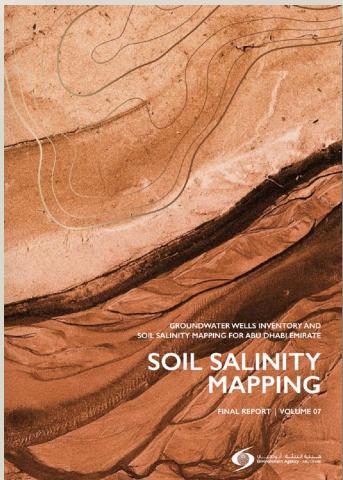


SURVEY RESULTS

Produce maps on 3 different scales for the agricultural areas:

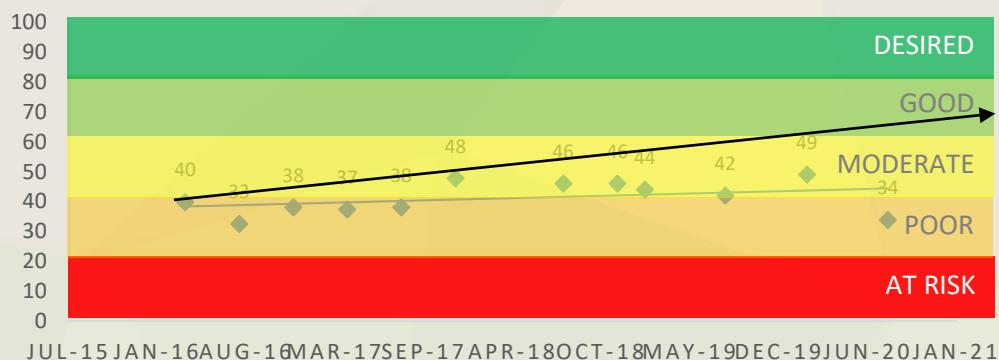
- 1:25,000
- 1:100,000
- 1:500,000

- Soil salinity maps at 3 soil depths
- Soil classification map
- Soil pH map at 3 soil depths
- SAR map at 3 soil depths
- Soil irrigation suitability map



SOIL SALINIZATION INDEX

- Average soil salinity 8-16 dS/m (highly saline soil, FAO)
- High salinity tolerant crops such as date palm are facing 50% reduction in yield.



The index tends to aggregate and generalize trends and so should be viewed as a policy tool to give a general overview of state and trend over time.



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SOIL SALINITY MANAGEMENT PLAN

This plan was developed in collaboration with all relevant stakeholders locally and nationally.

The technical committee included representatives of:

- Abu Dhabi Agriculture and Food Safety Authority (ADAFSA)
- Abu Dhabi Municipality (ADM)
- Abu Dhabi National Oil Company (ADNOC)
- Al Ain Municipality (AAM)
- Al Dhafra Region Municipality (DRM)
- Department of Municipalities and Transport (DMT)
- International Center for Biosaline Agriculture (ICBA)
- Ministry of Climate Change and Environment (MOCCAE)
- Statistics Centre Abu Dhabi (SCAD)



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SOIL SALINITY MANAGEMENT PLAN

SECTION I

General principles for the best use of groundwater resources, and the maintenance and improvement of soil resources.

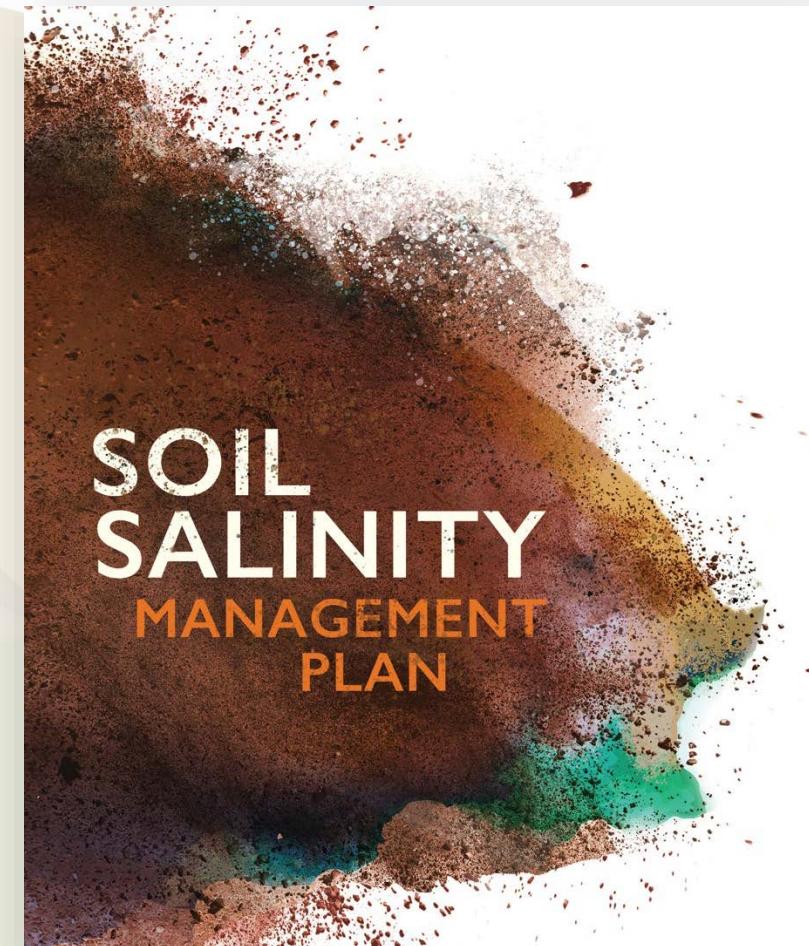
SECTION II

Recommended actions are listed in separate tables for each of the 16 irrigation districts. A description is given of the existing conditions of irrigated soils and irrigation water, and specific recommendations are developed for each area (irrigation, crop selection, fertilization and other parameters).

SECTION III

Terms, categories and classes of soil and irrigation water are explained as used in the characterization and recommendations produced for each individual irrigation district. Explanations and examples are also provided for crop water requirements and leaching requirements.

<https://www.ead.gov.ae/storage/soil%20Salinity%20low%20res%20English.pdf>



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The background of the image is a high-resolution aerial photograph of agricultural land. The fields are a mix of dark brown, light brown, and green colors, indicating different soil types and crop types. Some fields are in long, narrow strips, while others are larger and more irregular. There are also some small, dark, circular features that could be ponds or small lakes. The overall texture is somewhat grainy, typical of satellite imagery.

SECTION I

GENERAL RECOMMENDATIONS

FOR SOIL MANAGEMENT

SOIL SALINITY MANAGEMENT PLAN- SECTION I

General Recommendations For Soil Management

1. **A long-term policy** should match good quality water resources to the best available soils;
2. **Providing incentives** to abandon locations with highly saline water and/or soil resources with severe restrictions.
3. **Farm soil survey mapping** and UAESIS data from the Soil Map of the Emirate of Abu Dhabi should be leveraged as much as possible to shape future regional agricultural policies.
 - Conducting rural planning reviews to determine if good soil resources match good water resources and vice versa.
 - Reviewing the suitability of locations with highly saline water and/or soil resources with severe restrictions.
 - If practical, reviewing the possibility of relocating agricultural properties and businesses.
4. **scientific approaches** should be enlisted to improve the reasonable use of soil and water resources: applying water in appropriate quantities according to crop water requirements and leaching needs.
5. **Management recommendations** issued to control salinity and alkalinity need to deal with the principal factors influencing salinity: precipitation, leaching, ascending capillary action of dissolved salts, irrigation management and impermeable layers.



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SECTION 2

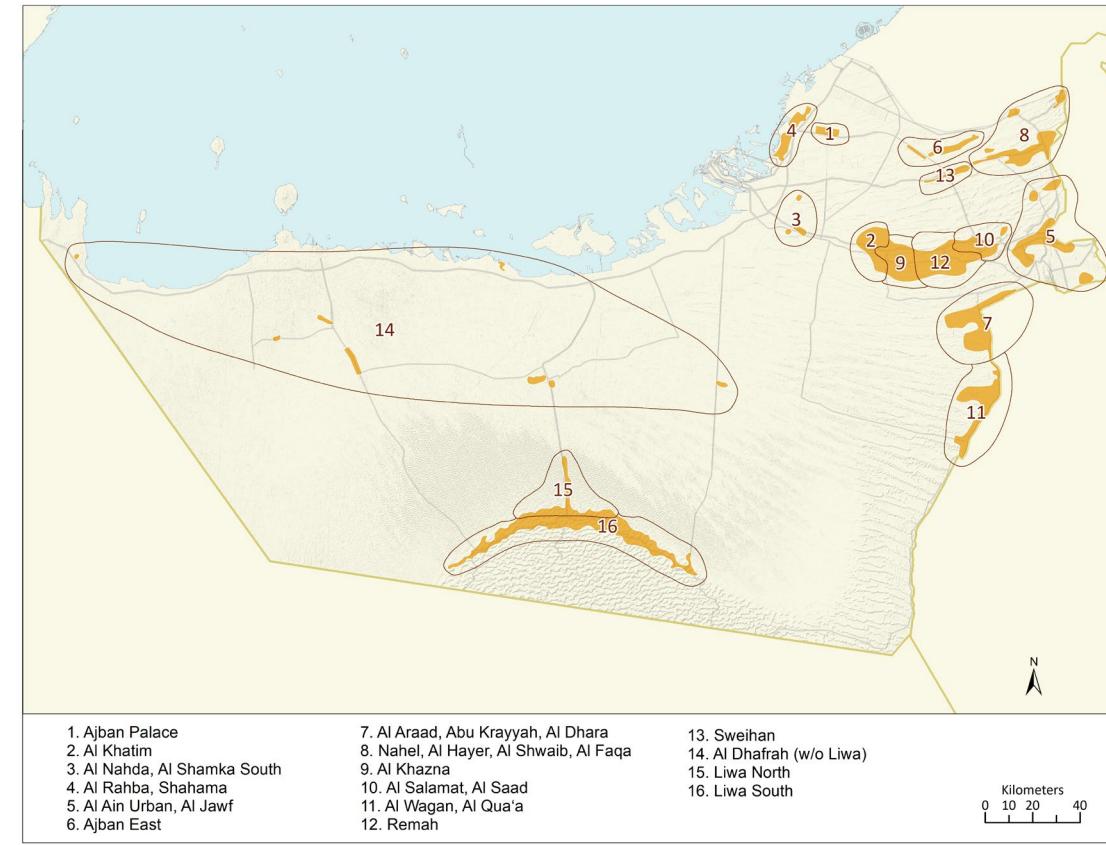
SPECIFIC RECOMMENDATIONS

FOR IRRIGATION DISTRICTS

SOIL SALINITY MANAGEMENT PLAN- SECTION II

Specific Recommendations For Irrigation Districts

- The agricultural area was divided into 16 irrigation districts.
- Specific restrictions and recommendations for each irrigation district regarding to:
 - Soil,
 - Irrigation,
 - Salinity management.

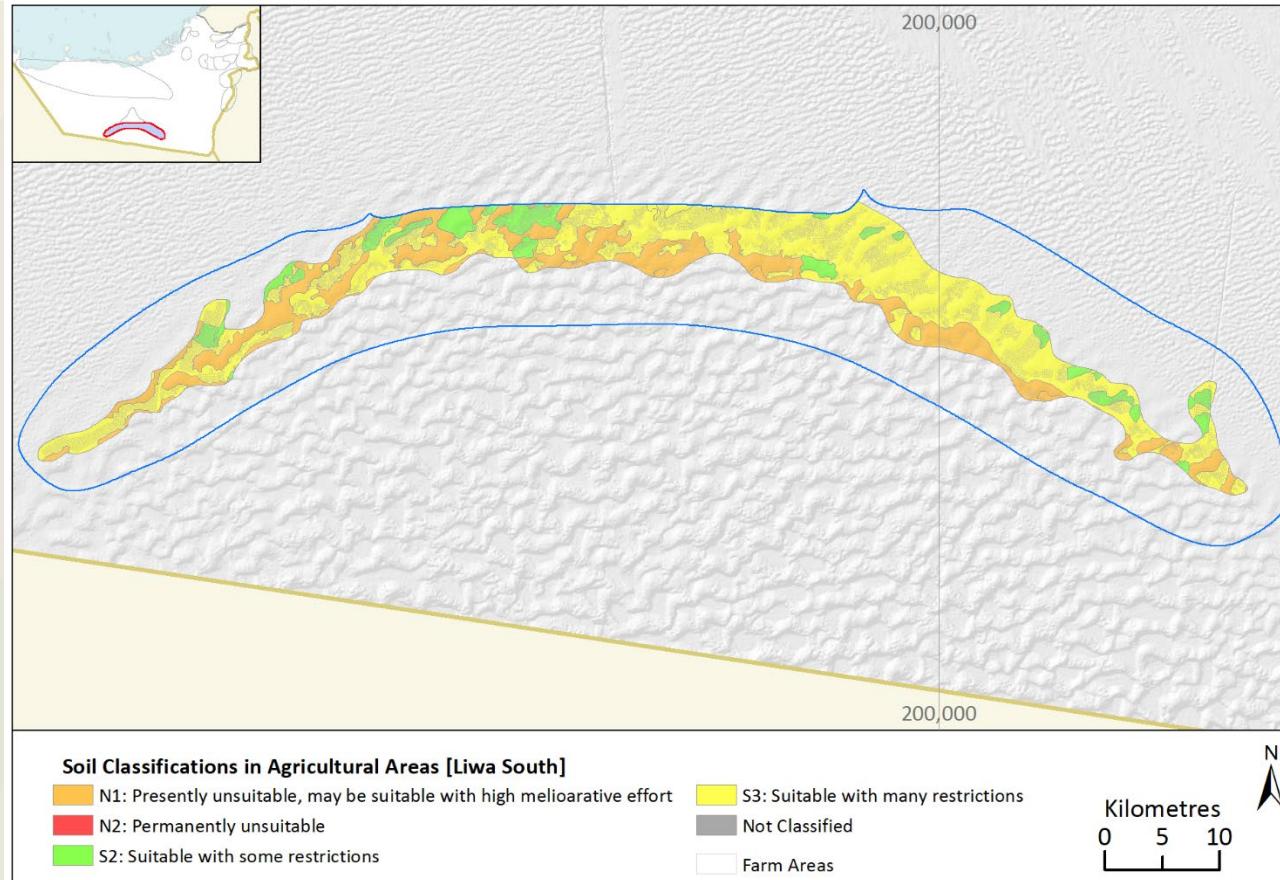


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SOIL SALINITY MANAGEMENT PLAN- SECTION II

Specific Recommendations For Irrigation Districts



Liwa South

SOIL EXISTING CONDITIONS
Liwa South
TEXTURE Sand
GENERAL CHARACTERISTICS Levelled dunes
ROOTING DEPTH >150 cm
SALINITY ECe 8,000-40,000 µS/cm, medium to very high
GROUNDWATER PRESENCE By over-irrigation or leakage
FERTILITY Low
DRAINAGE Excessive
PERMEABILITY Very good

IRRIGATION WATER EXISTING CONDITIONS
Liwa South
ORIGIN Well water
SALINITY ECw 22,000 µS/cm, high
SAR 22, high
AVAILABLE QUANTITY Available
CURRENT AVERAGE USE M³/IRRIGATED HA 57,000, high

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SOIL SALINITY MANAGEMENT PLAN- SECTION II

Specific Recommendations For Irrigation Districts

Recommendations for Liwa South



Map Units

TTP36s

TTP36t

Total Farm Area

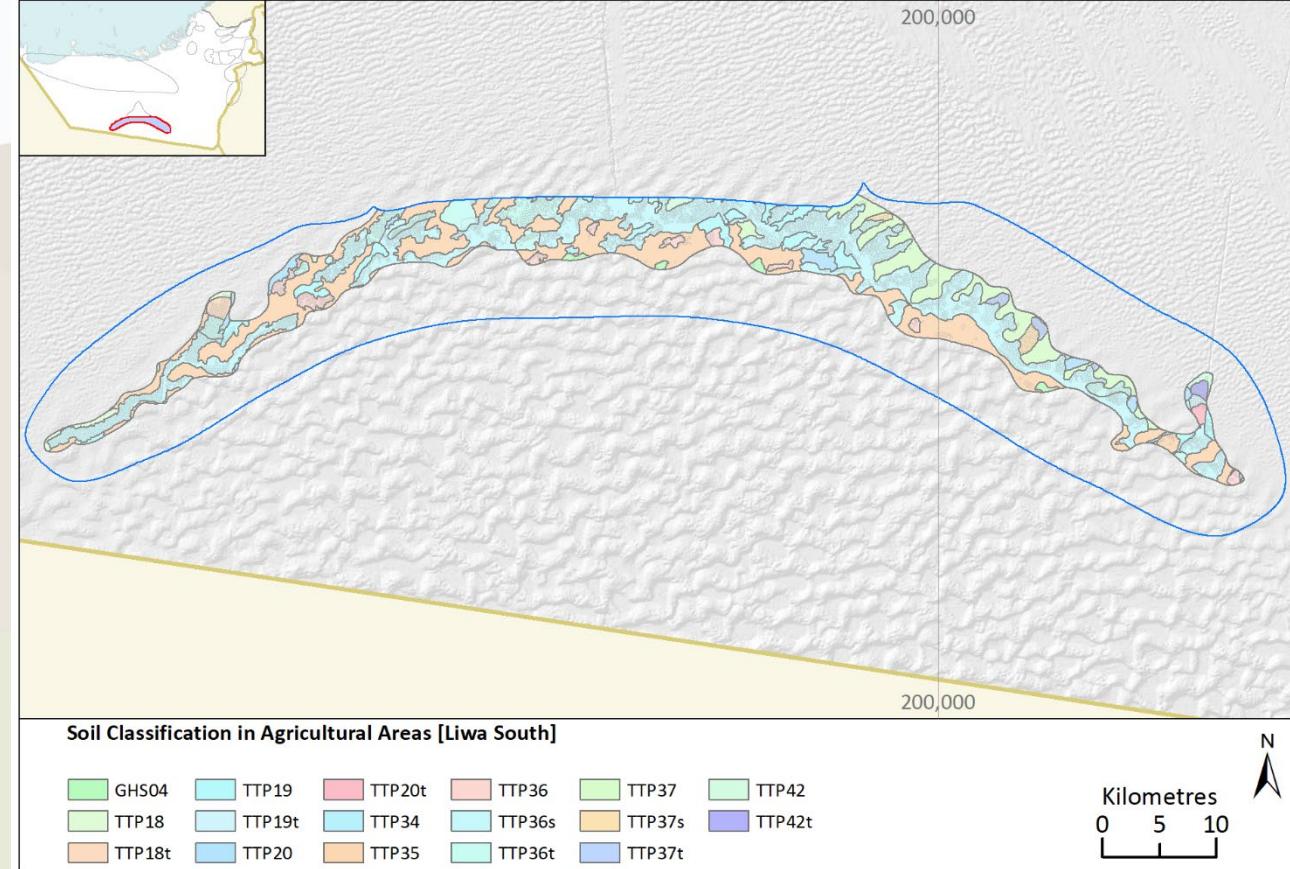
7,550.7 ha

68%

1,652.2 ha

15%

MAP UNITS	TTP36s	TTP36t
DESCRIPTION	Typic Torripsamments consociation, undulating rises and valleys, agricultural use, high salinity	Typic Torripsamments consociation, undulating rises and valleys, agricultural use, low salinity
SUITABILITY	RESTR 1 S3 RESTR 2 t	RESTR 1 r RESTR 2 t
IRRIGATION	All-year crops with drip irrigation no more than 32,000 m ³ /ha. Switch from flood irrigation to sprinkler or drip	All-year crops with drip irrigation no more than 32,000 m ³ /ha. Switch from flood irrigation to sprinkler or drip
LEACHING (DESLINATION)	Apply in winter months. Target salinity maximum 1.5 x of irrigation water salinity, apply 27% above crop water requirements for drip and sprinkler irrigation. No extra leaching needed for flood irrigation (high percolation losses)	Apply in winter months. Target salinity maximum 1.5 x of irrigation water salinity, apply 27% above crop water requirements for drip and sprinkler irrigation. No extra leaching needed for flood irrigation (high percolation losses)
CROP SELECTION	Salinity and alkalinity resistant crops: Date palm, Rhodes grass, Alfalfa	Moderately salinity resistant crops, vegetables, except alkalinity susceptible avocado, nuts, citrus
FERTILIZATION	Low fertilizer quantities in frequent doses, organic fertilizer	Low fertilizer quantities in frequent doses, organic fertilizer
DRAINAGE CONTROL	Not needed	Not needed
ALKALINITY CONTROL	Gypsum soil amendments when using desalinated water	Gypsum soil amendments when using desalinated water
MELIORATION MEASURE	Desalination plant, terrain levelling, compost/manure	Compost/manure, terrain levelling



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SECTION 3

TERMS OF SOIL, WATER AND CROP MANAGEMENT

SOIL SALINITY MANAGEMENT PLAN- SECTION III

Terms of Soil, Water & Crop Management

This section provides definitions for terms and expressions considered necessary to understand water and soil conditions. It further presents management recommendations for specific agricultural areas identified in the Emirate of Abu Dhabi.

- Leaching of salinity, Calculating the Leaching Requirement percentage (surface irrigation & drip irrigation)
- Crop selection according to water quality
- Soils with drainage problems, over-irrigation
- Irrigation suitability
- Crop tolerance and yield potential of selected crops as influenced by irrigation water salinity (ECw) or soil salinity (ECe) - Water Quality for Agriculture; FAO.

<https://www.ead.gov.ae/storage/soil%20Salinity%20low%20res%20English.pdf>



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SOIL SALINITY MANAGEMENT PLAN

Next Steps

- **Develop an executive soil salinity management plan** based on the soil salinity management plan in collaboration with all relevant stakeholders
- **Development of soil protection policy** for the Emirate of Abu Dhabi which will address soil salinity and other pressures on the soil of Abu Dhabi Emirate.
- **Conduct a long-term soil monitoring programme** to report KPIs which are essential for developing a nationwide model for the optimization of available water and soil resources.
- **Manage irrigation as per the recommendations** for each district to reduce soil salinity and maintain a sustainable healthy agricultural soil.
- **Conduct similar studies in the other Emirates** utilizing the knowledge and experience gained from the current research.



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Thank you





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