



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; SP-8(12): 502-503
Received: 21-10-2025
Accepted: 24-11-2025

Haleema Al-Mashhadani
Department of Soil Science and
Water Resources, Faculty of
Agricultural Engineering Sciences,
Iraq

Wajdan Talib Kazim
Department of Soil Science and
Water Resources, Faculty of
Agricultural Engineering Sciences,
Iraq

The role of soil survey in managing land salinity and alkalinity: Review

Haleema Al-Mashhadani and Wajdan Talib Kazim

DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i12Sg.4506>

Abstract

The term salinization encompasses both soil alkalinity and salinity, and it is very important to listen carefully as it indicates land degradation and consequently reduces agricultural crop productivity, as well as the health of the ecosystem and the importance of land use. Effective management of such problems relies primarily on accurate and crucial information about soil properties. This information can be obtained through soil surveys, which will be explained in this article, given the significant role soil surveys play in assessing, monitoring, and guiding land reclamation, particularly in salt-affected areas, using advanced technological methods (FAO, 2021) ^[2].

Keywords: Salinity, alkalinity, soil

Introduction

Soil salinity and alkalinity are among the most critical problems threatening agricultural production in arid and semi-arid regions. Soil surveying is considered a fundamental step in understanding the nature of these problems and developing plans for their management and reclamation. Through surveying, the physical, chemical, and spatial characteristics of the soil are determined, which helps in assessing the extent and spatial distribution of salinity and alkalinity, and in developing strategies for reclamation and sustainable management (FAO) (2021) ^[2].

Firstly: The Concept of Soil Survey

It is the process of collecting, analyzing, and classifying soil data in the field and laboratory to determine its characteristics and spatial distribution. It relies on field observations, chemical analyses, and the use of Geographic Information Systems (GIS) and remote sensing imagery (FAO & ITPS.2021) ^[2].

Secondly: The Concept of Soil Salinity and Alkalinity

- **Salinity:** High concentration of dissolved salts in the soil solution, which reduces the plant's water uptake.
- **Alkalinity:** High concentration of sodium ions compared to calcium and magnesium, leading to the deterioration of the soil's physical structure. (Rengasamy, 2006) ^[5].

Thirdly: The Role of Soil Survey in Managing Salinity and Alkalinity

1. **Diagnosis and Spatial Identification:** A primary priority of surveying is mapping, including maps showing the distribution of salinity and alkalinity prevalent in fields or regions, using GIS techniques. (Metternicht & Zinck, 2003) ^[4].
2. **Analysis of Soil Chemical Properties:** These include electrical conductivity, the percentage of basic cations, soil acidity (pH), as well as the percentage of dissolved salts, among others. (Scudiero, *et al.* 2015) ^[6].
3. **Identifying the Causes and Sources of Salinity:** This is very important, as knowing the source, such as saline irrigation water or poor drainage water, contributes to its mitigation.

Corresponding Author:
Haleema Al-Mashhadani
Department of Soil Science and
Water Resources, Faculty of
Agricultural Engineering Sciences,
Iraq

4. **Guiding Management and Reclamation:** Upon identifying the sources of salinity, it is preferable to implement suggestions and take necessary measures such as improving drainage, leaching with good quality water (low in salinity or salt-free), using amendments like agricultural gypsum, and cultivating and testing resistant crops.
5. **Monitoring and Temporal Follow-up:** After receiving the survey report and its results, they are used as a basis for continuous comparison to evaluate the effectiveness of management programs (Corwin, & Scudiero, 2020) ^[1].

Fourthly: The Role of Modern Technologies in Surveying

The use of geospatial technologies to monitor changes in salinity by relying on spectral indices and producing accurate maps for it, along with spatial modeling predicting the future spread of salinity. (Metternicht, & Zinck 2003) ^[4].

Fifthly: The Economic and Environmental Impact

- **Economically:** The use of survey works reduces agricultural production losses and improves the efficiency of resource use.
- **Environmentally:** It prevents land degradation and maintains ecological balance (Scudiero, *et al.* 2015) ^[6].

Conclusion

Soil survey is the cornerstone of any successful program for managing land salinity and alkalinity. It is not limited to data collection but represents a tool for sustainable agricultural planning and guiding decisions towards improving productivity and conserving natural resources.

References

1. Corwin DL, Scudiero E. Field-scale monitoring of soil salinity. *Geoderma*. 2020;361:114092.
2. Food and Agriculture Organization of the United Nations (FAO). Global map of salt-affected soils (GSASmap). Rome: FAO; 2021.
3. Lobell DB, Lesch SM, Corwin DL, Ulmer MG, Anderson KA, Potts DJ, *et al.* Regional-scale assessment of soil salinity using multispectral remote sensing and electromagnetic induction measurements. *Remote Sens Environ*. 2010;114(9):2045-2056.
4. Metternicht GI, Zinck JA. Remote sensing of soil salinity: potentials and constraints. *Remote Sens Environ*. 2003;85(1):1-20.
5. Rengasamy P. World salinization with emphasis on Australia. *J Exp Bot*. 2006;57(5):1017-1023.
6. Scudiero E, Skaggs TH, Corwin DL. Regional-scale soil salinity assessment using Landsat ETM+ canopy reflectance. *Remote Sens Environ*. 2015;169:335-343.
7. United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). Soil Survey Manual. Washington (DC): USDA Handbook No. 18; 2014.
8. Zaman M, Shahid SA, Heng L. Guideline for salinity assessment, mitigation and adaptation using nuclear and related techniques. Cham: Springer; 2018.