

# Crop Production in Salt Affected Soils

**I. C. Gupta**  
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## The Authors



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# Crop Production in Salt Affected Soils

**Second Revised & Enlarged Edition**

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## PREFACE

Salt affected soils have been a part of the Indian land scape from time immemorial. Reference to *Usar* land has been made in the Epic Ramayana written by poet saint Tulsidas in *Vikram Samvat* 1631 (1574 CE). At one place he compares some of the issues that have little possibilities to happen with sowing of seeds in *usar* land having no possibility of germination. He says: 'ऊसर बीज बाँँ फल जथा' meaning ऊसर में बीज (बोने की भाँँति यह सब) व्यर्थ जाता है. With the first reported incidence of water logging and soil salinity as a result of irrigation in the western Jamuna canal command in Haryana in 1855, we have travelled a long way. Currently, 6.73 million hectare (M ha) area is known to be affected by salts where nothing can be grown. On the other hand, these soils are potentially productive but for the excess accumulation of salts. If the salts are removed or one can perfect the art of living with the salts (manage), these soils can ensure livelihood to nearly 7 million farm families (assuming an average holding size of 1 ha) and contribute to the extent of 55 million tons to the national food grains kitty.

Systematic studies on reclamation and management of salt affected soils have been carried out for more than 150 years. Tremendous advances however, have only been made during the last five decades especially following the establishment of CSSRI, Karnal. Realizing the emerging challenges, land reclamation is a major thrust area of research in India. Moreover, to prepare the young graduates to learn the art of dealing with the daunting task of land reclamation, this subject is taught in all the state agricultural universities and deemed universities. The current publication titled 'Crop Production in Salt Affected Soils' provides a comprehensive treatise of the fundamentals of soil salinization-desalinization and reclamation and management of salt affected soils. It also describes

crop production technologies to green these white manmade deserts. Our endeavor has been to make it a comprehensive text book for the students of agriculture and agricultural engineering. Besides, our efforts are directed to make this publication a handy practical guide for the personnel of the line departments such as water resources, agriculture, irrigation, private enterprises and non-government organizations who are called upon to implement projects related to reclamation and management of salt affected soils.

The book has been divided into 16 chapters. Although we have not categorized the chapters in different sections, broadly they can be grouped as under:

First two chapters are the introductory chapters that discuss the categorization of salt affected soils, their extent and distribution and physical, chemical and biological properties of these soils.

Next eight chapters describe the basic principles and practices that go into any land reclamation program. These chapters include on-farm development, hydrology, irrigation practices, drainage methods, leaching and soil salinization, chemical amendments, new innovative techniques of land reclamation and agronomic and cultural practices. Since segregating the water quality problem from that of saline and alkali land reclamation is almost impossible, chapter eleven describes the characteristics of saline/alkali water, their distribution and management options.

Crop production practices for select cereal, oil seeds, sugar, fiber and forage including green manure crops are included in chapters twelve to fourteen. Cultivation of forage grasses and potential of forest plantations on salt affected soils is subject matter of discussion of chapter fifteen.

Chapter sixteen covers the economic evaluation and social issues involved in any land reclamation program. In all the chapters wherever relevant, illustrations and solved examples have been included for the benefit of the students. Glossary of commonly used terms has also been included.

The textbook is written in a very clear and easy-to-understand language by a team of two researchers, a soil scientist and an agricultural engineer. Both of them remained actively associated with land reclamation activities throughout their service career.



Thus, besides the basic concepts, field examples are included to explain the impacts of various interventions.

The authors place on records the contributions of CSSRI and several state agricultural universities for their contributions in developing technologies to reclaim salt affected soils and manage saline water for irrigation. Few of the SAUs contributing significantly to this field and having close working relationship in one form or the other with CSSRI are: PAU, Ludhiana, CCSHAU, Hisar, SK Bikaner Agricultural University, Bikaner, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, Professor Jayashankar Telangana State Agricultural University, Hyderabad, Acharya NG Ranga Agricultural University, Lam, Guntur, Tamil Nadu Agricultural University, Coimbatore and University of Agricultural Sciences, Raichur. Authors are also grateful to many of their colleagues in the profession, who have given their inputs on many of the issues through suggestions, supply of their publications and discussions during preparation of the book. Special thanks are due to Dr. S.K. Chaudhary, ADG, ICAR, New Delhi, Dr. P.C. Sharma and Dr. D.K. Sharma, current and former directors respectively and Dr. D.S. Bundela, Head Division of Irrigation and Drainage Engineering, and Sh. Madan Singh of the Central Soil Salinity Research Institute, Karnal for active cooperation. Only because of this guidance and support, it has been possible to collect and synthesize the available information included in this book. The authors at the end express their heartfelt thanks to their respective family members. Without their full support, it might not have been possible to bring this project to its logical end.

The authors believe that the current publication will serve to meet the widely felt need of a comprehensive textbook and guide on land reclamation. We hope that it will find a place in the shelves of libraries of all the universities and personal collection of teachers, researchers and field functionaries. We will highly appreciate the feedback and contributions in the form of case studies or research results that might help to enrich the future editions of this textbook.

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