

Soil and Water Conservation Engineering

Soil and Water Conservation Engineering

Dr. Shiv Singh Basediya

Assistant Professor, Agricultural Engineering
Faculty of Agriculture, RKDF University, Bhopal – 462033 (M.P.)

Dr. Rajesh Gupta

Scientist, Agricultural Engineering
RVSKVV-KVK Mandsaur – 458001 (M.P.)

Dr. Deepak Chouhan

Scientist, Agricultural Engineering
JNKVV-KVK Shahdol – 484001 (M.P.)

Dr. J Himanshu Rao

Guest Faculty (Agricultural Engineering), Soil and Water Engineering
College of Agricultural Engineering, JNKVV, Jabalpur – 482004 (M.P.)

Dr. Mahesh Prasad Tripathi

Assistant Professor, Agricultural Engineering (Sr. Scale)
Dr. KSGA College of Agriculture
Eternal University, Baru Sahib – 173101 (H.P.)

Er. Neeraj Jain

Assistant Professor, Agricultural Engineering
Faculty of Agriculture, RKDF University, Bhopal – 462033 (M.P.)



ORBIT INK PUBLICATION

Kota, Rajasthan, India

Copyright © 2026 ORBIT INK PUBLICATION

Published by Orbit Ink Publication

First Edition: 2026

All Rights Reserved

No part of this book may be reproduced in any form, by photostat, microfilm, xerography, or any other means, or incorporated into any information retrieval system, electronic or mechanical, without the written permission of the publisher.

Product Form:

Digital download, online and hard bound

Edition:

ISBN: 978-81-686107-7-4

Head, Production (Higher Education and Professional) & Publishing Director

Dr. Jitendra Mehta

Product Manager

Aman Saxena

General Manager

Jaya Mehta

Graphic Designer

Kritika Lohomi

Information contained in this work has been obtained by Orbit Ink Publication (India), from sources believed to be reliable. However, neither Orbit Ink Publication (India) nor its authors guarantee the accuracy or completeness of any information published herein, and neither Orbit Ink Publication (India) nor its authors shall be responsible for any errors, omissions, or damages arising out of use of this information. This work is published with the understanding that Orbit Ink Publication (India) and its authors are supplying information but are not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be required.

Office Address:

ORBIT INK PUBLICATION

Plot No. A-73, Shubh Aangan, Raipura, Kota,
Rajasthan-324004 India

Visit us at: <https://orbitink.vitalbiotech.org>

Contact No. +91-9784677044

Printed at: Orbit Ink Publication, Kota

Preface

Soil and water are the fundamental resources supporting agricultural production, food security, ecological stability and rural livelihoods. However, increasing population pressure, intensive cultivation, deforestation, climate variability, land degradation and unsustainable water use have accelerated soil erosion, declining soil fertility, water scarcity and watershed degradation. These challenges highlight the need for sound engineering principles and integrated conservation practices that protect soil resources, improve water-use efficiency and sustain agricultural productivity.

This book, *Soil and Water Conservation Engineering*, has been developed to provide a comprehensive and practical understanding of the principles, technologies and applications used for conserving soil and water resources. It integrates fundamental concepts of soil erosion, hydrology, soil-water relationships, erosion prediction, watershed management, drainage, irrigation and land reclamation with modern engineering approaches. Particular emphasis is placed on understanding the causes of resource degradation and selecting appropriate conservation measures according to soil, climate, terrain and land-use conditions.

The book discusses both structural and agronomic measures, including contour farming, contour bunding, graded bunds, terraces, waterways, check dams, farm ponds, conservation tillage, mulching, vegetative barriers and watershed-based interventions.

The objective of this book is not merely to describe conservation technologies but to develop an engineering perspective for diagnosing resource problems, evaluating alternatives and designing sustainable solutions. It is hoped that the book will serve as a useful academic and professional reference and contribute to the development of resilient, productive and environmentally sustainable agricultural landscapes.

Dr. Shiv Singh Basediya

Date – 20 Aug., 2026

Dr. Rajesh Gupta

Dr. Deepak Chouhan

Dr. J Himanshu Rao

Dr. Mahesh Prasad Tripathi

Er. Neeraj Jain

CONTENTS

S. NO.		PAGE NO.
1.	Climate-Resilient Soil and Water Conservation Engineering	1-14
2.	AI and Machine Learning for Soil Erosion Prediction and Conservation	15-28
3.	GeoAI and Remote Sensing for Soil and Water Resource Management	29-42
4.	Smart Irrigation Systems for Water Conservation and Agricultural Sustainability	43-56
5.	IoT-Based Soil Moisture Monitoring and Precision Water Management	57-72
6.	Nature-Based Solutions and Soil Bioengineering for Erosion Control	73-86
7.	Climate-Smart Watershed Management and Hydrological Engineering	87-100
8.	Advanced Rainwater Harvesting and Managed Aquifer Recharge Technologies	101-112
9.	Digital Soil Mapping and Spatial Decision Support for Conservation Planning	113-126
10.	Hydrological Modeling and Predictive Analytics for Watershed Conservation	127-144
11.	Conservation Agriculture for Soil Health and Water-Use Efficiency	145-160

- | | | |
|------------|---|----------------|
| 12. | Engineering Approaches for Salinity Sodicity & Land Degradation Management | 161-174 |
| 13. | Green Infrastructure for Flood Runoff and Sediment Management | 175-188 |
| 14. | Physics-Informed and Hybrid AI Models for Soil Erosion Assessment | 189-198 |