
Advanced Technologies for Enhancing Productivity and Sustainability in Agriculture

Advanced Technologies for Enhancing Productivity and Sustainability in Agriculture

Editors

Veerendra K Chandola

Shrinivasa DJ

Ram Mandir Singh

Anupam K Nema

Abhishek Singh

Vinod K Tripathi

Rajan Kumar

Shashi Shekhar

Reema Sharma

Aaditya Pandurang Jadhav



NEW DELHI PUBLISHERS

New Delhi, Kolkata

This First Edition Published in 2026

© 2026 New Delhi Publishers, India

Title: Advanced Technologies for Enhancing Productivity and Sustainability in Agriculture

Editors: Veerendra K Chandola, Shrinivasa DJ, Ram Mandir Singh, Anupam K Nema, Abhishek Singh, Vinod K Tripathi, Rajan Kumar, Shashi Shekhar, Reema Sharma, and Aaditya Pandurang Jadhav

Description: First edition | New Delhi Publishers 2026 | Includes bibliographical references and index.

Identifiers: ISBN 9789349897915 (Print) | 9789349897120 (eBook)

Cover Design: New Delhi Publishers

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Disclaimer: Whereas every effort has been made to avoid errors and omissions, this publication is being sold on the understanding that neither the editors (or authors) nor the publishers nor the printers would be liable in any manner to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publisher, for rectifying it in future editions, if published.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.



NEW DELHI PUBLISHERS

Head Office: 90, Sainik Vihar, Mohan Garden, New Delhi, India

Corporate Office: 7/28, Room No. 208-209, Vardaan House, Mahavir Lane, Ansari Road, Daryaganj, New Delhi, India

Branch Office: 216, Flat-GC, Green Park, Narendrapur, Kolkata, India

Tel: 011-23256188, 011-45130562, 9971676330, 9582248909

Email: ndpublishers/rediffmail.com@gmail.com

Website: www.ndpublisher.in

Preface

Economic advancement in agriculture is crucial for inclusive national development. India's Green Revolution has led to significant increases in agricultural output, reducing poverty and hunger. However, sustainability must coexist with economic viability and livelihood security for farmers. Agriculture faces numerous challenges, including food and energy security, environmental protection, economic viability, climate adaptation, and social justice. Creative problem-solving, systems thinking, and cross-sector cooperation are needed to navigate these interconnected objectives. Understanding the ecological foundations of agriculture and related disciplines is essential for achieving sustainability.

An integrated approach that takes into account the social, cultural, political, and economic facets of sustainability is crucial to addressing the complex issues facing modern agriculture. The creation and application of cutting-edge, regionally specific, economical, and ecologically sustainable technologies that not only improve agricultural output and input use efficiency but also protect and replenish essential natural resources is at the heart of this strategy. A number of Sustainable Development Goals (SDGs), particularly SDG 2: Zero Hunger and SDG 12: Responsible Consumption and Production, are directly impacted by increased agricultural productivity and sustainability. By doing this, agricultural systems can become more equitable, resilient, and able to fulfil the twin objectives of environmental sustainability and food security.

In this context, a two-day national seminar has been organized by the Department of Agricultural Engineering, BHU (in collaboration with the Institution of Engineers-India, Varanasi Centre, ISAE-Varanasi Chapter) on the topic "Advanced Technologies for Enhancing Productivity and Sustainability in Agriculture" to address the issues and challenges ahead in the 21st century. The seminar provides a platform to scientists, academicians, students, scholars, industry experts, and policymakers to share innovative research, practical insights, and policy-oriented solutions aimed at shaping a more productive and sustainable agricultural future. Emphasis has been given on novel strategies based on the themes of the application of cutting-edge technologies such as Artificial Intelligence (AI), Internet of Things (IoT) and drones in agriculture; advancements in irrigation, drainage, and salinity management; soil and crop health in rainfed systems; precision farming and

robotics; climate change forecasting; post-harvest innovations; renewable energy use; waste management; and integrated crop improvement strategies.

The organizing committee and editor wish to acknowledge on record their appreciation for the financial assistance received from the Sponsored Research and Industrial Consultancy Cell (SRICC-BHU), the Research and Development Fund of the National Bank for Agricultural and Rural Development (NABARD), and the Ministry of JalShakti-GoI, towards this publication.

The organizing committee feels indebted to all those who directly and indirectly contributed towards the successful organization of the National Seminar and the efforts required for enhancing productivity and sustainability in agriculture.

Editors

Contents

<i>Preface</i>	v
1. How Drones are Helpful for Agriculture?	1
S. K. Goyal, Jai P. Rai, Durga Shankar Bunkar and Jitendra Kumar	
2. Plant Protection in Natural Farming	15
Omprakash Bharti, Sarvesh Kumar, Sunil Kumar Jatav and Roop Chand Jatav	
3. Mechanization of Natural Gums and Resin Exudates Based Tapping Practices	25
AK Mishra, SK Giri, SC Sharma, SK Pandey and A Kar	
4. Site Specific Weed Management through Ground Robotic Technologies	45
Neelkamal Mishra, Pratik Sanodiya, Sudhir Kumar Rajpoot, Nikhil Kumar Singh, Abhishek Patidar and Ankit Kumar Yadav	
5. Ants Venom and Its Potential Application-Explore the Composition of Ant Venom and Its Potential Use in Medicine and Pest Control	57
Shruthi D. J., M. Prathibha and Shrinivasa D. J.	
6. Emerging Technologies under Precision Agriculture	67
Samikshya Panda, Vinod Kumar Tripathi, Deepak Kumar, Chinmaya Panda, Vijay Shankar Yadav and Harshita Rani Ahirwar	
7. Mulching for Climate-Smart Agriculture: A Pathway to Soil and Water Conservation in Dryland Farming	75
Chinmaya Panda, Ram Mandir Singh, Samikshya Panda, Vijay Shankar Yadav and Harshita Rani Ahirwar	
8. Greenhouse Cultivation in India: A Pathway to Sustainable and Productive Agriculture	87
V. S. Yadav, R. V. Galkate, V. K. Chandola, Samikshya Panda, Chinmaya Panda, Harshita Rani Ahirwar, Ankit Patel, Deepak kumar	

9. Impact of Integrated Soil and Water Conservation Practices on Soil Health and Agricultural Productivity in Bundelkhand, Central India	97
Ankit Patel, Ramesh Singh, R. M. Singh, Vijay Shankar Yadav and Deepak Kumar	
10. Green Nanotechnology as a Tools in Plant Disease Management	107
Priyanshu Rad, Satyendra Pratap Singh and Jharjhari Chakma	
11. Climate Change Vulnerability Assessment in Different Agro Climatic Zones of Bihar, India	117
Harshita and M. Anoop	
12. Soilless Cultivation for Sustainable Agriculture: Systems, Substrates, and Smart Technologies	127
Ramlakhan Singh Thakur, Chandra Kant Saxena, Ravindra D Randhe, Songthet Chinnunnem Haokip	
13. Pyrolysis: A Comprehensive study of Its Subcategories and By-Products	143
Sachin Channappa Hallad and N. L. Panwar	
14. Viability of Organic Vegetable Farming in Hilly Districts of Nepal: An Assessment Using SWOT and MCDM	155
Saikat Maji, Preeya Tiwari, Shrinivasa D J and Waris Ali	
15. Harnessing AI and IoT for Intelligent Irrigation Systems	173
Aakriti Jha and Sudhir Kumar Rajpoot	
16. Transforming Agriculture with Automation: Robotics and Drone Technologies in Precision Farming	185
Madhusudan B. S., Aruna T. N., Shashi Kumar, Shriramulu and D. J. Shrinivasa	
17. Application of GreenSeeker Sensor in Precision Agriculture	201
Shashikumar, D.J. Shrinivasa, Madhusudan B S, Shriramulu and G. Senthil Kumaran	

18. Advancing Agriculture through Renewable Energy Technologies	209
Shriramulu, Shashikumar, D.J. Shrinivasa, Madhusudan B S, and Nagarthna	
19. Performance Evaluation of Sub-surface Drainage System for Semi-arid Regions	223
Vinod Kumar Tripathi	
20. Integrated Soil Fertility Management (ISFM): A Tool for Sustainable Soil Health Improvement	233
Ramawatar Meena, Ramjeet Meena, Abhishek Kumar Meena, Yogendra Meena and Saubham V. Wandre	
21. Statistical Procedures for Agricultural Research	243
Rajan Kumar, Shashi Shekhar, Banavath Samuel Naik	
22. Geospatial Statistics for Precision Agriculture	261
D. Abinayarajam, C. Kumar and Reema Sharma	
23. Statistical Models for Fisheries Management	271
Pooja Patel and Shashi Shekhar	
• Abstracts	293