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INTEGRATIVE AGRICULTURE

2nd Edition



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Integrative Agriculture

(Second Edition)

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Integrative Agriculture

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The successful completion of this second edition of *Integrative Agriculture* would not have been possible without the unwavering support, guidance, and encouragement of numerous individuals and institutions.

First and foremost, we extend our deepest gratitude to our esteemed Professors and Seniors for their invaluable mentorship. Their expert guidance, thoughtful insights, and constructive feedback have played a crucial role in shaping the content and direction of this book, greatly enriching its quality and depth. We are also profoundly thankful to the broader research community whose pioneering studies and discoveries have laid the groundwork for this work. The relentless efforts of scientists in the fields of plant pathology and molecular research have served as a constant source of inspiration and direction throughout this endeavor.

A heartfelt thanks goes to our parents, Mr. Dharmendra Pandey and Mrs. Kanchan Pandey, and our friends for their unwavering support, patience, and belief in our work. Their continuous encouragement has been a driving force throughout the writing process.

We also wish to express our sincere appreciation to the publishers and the editorial team for their professional assistance and commitment to excellence. Their efforts have been instrumental in bringing this edition to life with the highest standards of quality.

This book is dedicated to all researchers, students, and professionals in the field of plant pathology who are working tirelessly to expand scientific knowledge and develop innovative, sustainable solutions for agriculture.

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FOREWORD

It is with great enthusiasm and anticipation that I introduce *Integrative Agriculture (Cultivating Knowledge across Disciplines)*, a work that seeks to redefine how we approach the cultivation of land, the raising of animals, and the sustainability of ecosystems. In a world increasingly defined by environmental challenges, social change, and economic pressures, the need for innovative solutions to the pressing issues of agriculture has never been more urgent. This book offers an invaluable perspective on an integrative approach to farming that balances productivity, ecological health, and social well-being.



Traditional agricultural practices, while foundational, often fail to address the complexities and interconnectedness of the ecosystems we rely on. Over the years, we have seen the consequences of short-term thinking, where soil degradation, water scarcity, and biodiversity loss are but a few of the environmental impacts of industrial farming. At the same time, the rising global demand for food, fiber, and energy has placed increasing pressure on our agricultural systems. It is against this backdrop that *Integrative Agriculture (Cultivating Knowledge Across Disciplines)* makes its timely and necessary contribution.

The contributors to this book come from diverse disciplines, each bringing a wealth of knowledge about organic farming, agroecology, permaculture, regenerative agriculture, and agro-forestry. They provide practical insights, real world case studies, and research findings that demonstrate how integrative agricultural practices can be implemented on a global scale. Through their collective expertise, we are presented with a vision of agriculture that is not only more sustainable but also more productive, equitable, and capable of meeting the needs of future generations.

As you explore the pages of *Integrative Agriculture (Cultivating Knowledge across Disciplines)*, you will encounter a roadmap for a more resilient and adaptive agricultural system, one that works in harmony with nature rather than against it. This book provides an invitation to rethink our relationship with the land and offers a path toward a more sustainable, integrated, and regenerative way of feeding the world.

Integrative Agriculture (Cultivating Knowledge across Disciplines) is not just a vision for the future; it is a call to action for all those who care about the planet and the generations to come.

It is my hope that this book serves as both a resource and a catalyst for change encouraging farmers, policymakers, researchers, and students alike to embrace an agricultural paradigm that integrates environmental, economic, and social sustainability at every level.



Prof. (Dr.) V. S. S. Kumar
Vice-Chancellor
Mandsaur University,
Mandsaur, M.P.

Former Chairman, NITTTR, Chennai.
Former Vice-Chancellor, JNTUK, Kakinada.
Former Vice-Chancellor, Vel Tech (Deemed to be University), Chennai.



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This book brings together experts from diverse disciplines, offering insights into organic farming, agroecology, permaculture, regenerative agriculture, and agroforestry. Through a combination of research findings, real-world case studies, and practical applications, the contributors present a vision for agriculture that is not only more sustainable but also more productive and equitable. Their collective expertise lays the groundwork for an agricultural paradigm that is resilient, adaptive, and aligned with the principles of ecological integrity.

As you explore the pages of *Integrative Agriculture*, you will discover a roadmap toward a more sustainable and regenerative agricultural system—one that works in synergy with nature rather than against it. This book challenges us to rethink our relationship with the land and offers actionable solutions for fostering a future where agricultural systems are dynamic, diverse, and capable of meeting the needs of future generations.

I am confident that this book will serve as a vital resource for farmers, policymakers, researchers, and students alike. It is not just a vision for the future but a call to action—one that urges us to move beyond conventional boundaries and embrace integrated approaches to agriculture that ensure environmental stewardship, economic viability, and social equity.

I extend my heartfelt congratulations to the authors and contributors for their remarkable efforts in bringing this essential work to fruition. May *Integrative Agriculture* inspire meaningful change and contribute to the transformation of global agricultural practices toward a more sustainable and just future.

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Dr. Tejveer Singh

Senior Scientist (Genetics & Plant Breeding)



FOREWORD

It is with immense enthusiasm and anticipation that I introduce *Integrative Agriculture: (Cultivating Knowledge Across Disciplines)*." This work aims to redefine our approach to agriculture amidst evolving environmental, social, and economic challenges. In an era where sustainability is crucial, this book offers a vital perspective on holistic farming—one that integrates productivity, ecological balance, and societal well-being. In an era marked by growing concerns over food security, climate change, and the depletion of natural resources, agriculture stands at the crossroads of a profound transformation. Traditional farming practices, while foundational to human civilization, are now being challenged by the complexities of modern environmental and economic pressures. It is within this context that integrative agriculture offers a transformative path forward.

Integrative agriculture is not just a set of techniques; it represents a philosophy that blends innovation with tradition. It seeks to harmonize the relationship between agriculture, the environment, and society, emphasizing sustainable practices that nourish both the land and the people who rely on it. This book serves as a vital resource for anyone seeking to understand and implement the different approaches of integrative agriculture, whether you are a seasoned farmer, a policy maker, or someone new to the world of agriculture.

The pages that follow offer a comprehensive exploration of the core concepts, strategies, and successes that define integrative agriculture. With chapters covering everything from agro-ecology and soil health to crop diversity and water management, this book not only provides practical insights but also highlights the importance of a systems-thinking approach to agriculture. In an age where sustainability is no longer optional but essential, integrative agriculture presents a blueprint for future farming. It is a model that prioritizes long-term environmental stewardship, economic viability, and social equity.

As you turn the pages of this book, I encourage you to reflect on the potential for change that integrative agriculture holds. It challenges us to re-imagine farming as a holistic, interconnected system—one that nourishes not only the land but also the communities and ecosystems it sustains. In doing so, it invites us all to participate in shaping a more resilient and sustainable agricultural future. This forward introduces *Integrative Agriculture (Cultivating Knowledge Across Disciplines)*," while setting the tone for a comprehensive exploration of its concepts and practical applications.

I wholeheartedly congratulate all editors, authors, and contributors for their outstanding efforts in bringing this essential work to life. May this book motivate readers and make them understand various agricultural practices of different disciplines."

Singh
20.02.2025

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PREFACE

Agriculture today stands at the crossroads of tradition and innovation. As global challenges such as climate change, food security, soil degradation, and dwindling natural resources reshape the agricultural landscape, the need for integrative and sustainable solutions has never been more urgent. This second edition of *Integrative Agriculture* emerges from that need—aimed at blending time-tested agricultural practices with modern scientific advancements to provide a holistic understanding of sustainable farming systems.

This book has been carefully curated to serve as a comprehensive resource for students, researchers, and professionals engaged in the multifaceted field of agriculture. Covering a wide spectrum of topics including crop production, plant pathology, soil health, integrated farming, biotechnology, and environmental sustainability, this edition brings together diverse insights from both traditional and contemporary agricultural sciences.

What sets *Integrative Agriculture* apart is its interdisciplinary approach. The book emphasizes the interconnectedness of various agricultural components—soil, water, crops, livestock, pests, and human intervention—and highlights how collaborative, systems-based thinking is key to addressing the complex issues faced by modern agriculture. We have made every effort to incorporate recent research findings, field practices, and policy developments to keep the content relevant and applicable. The inclusion of case studies, visual illustrations, and practical insights enhances the learning experience for readers, making the book not just informative but also engaging.

This edition is the result of collaborative effort and shared vision. We express our deepest appreciation to all our mentors, colleagues, and institutions who supported us throughout this journey. We hope this book will inspire its readers to innovate, adapt, and contribute meaningfully to the ever-evolving field of agriculture. We dedicate this work to the students, scientists, farmers, and practitioners who are relentlessly working towards building a sustainable and resilient agricultural future.

Dr. Ram Prakash Srivastava
Dr. Mukesh Kumar Singh
Dr. Saket Kumar
Prof. (Dr.) Dinesh Baboo Tyagi
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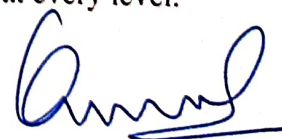
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Dr. Ram Prakash Srivastava (M.Sc. & Ph.D.) working as an Associate Professor in the department of Genetics and Plant Breeding, Mandsaur University, Mandsaur. He has 10 yrs teaching experience in the field of genetics and plant breeding. He has published 17 research papers, 13 review articles, 09 popular articles in NAAS and SCI indexed related International and National journals, 02 books and 04 book chapters.



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Dr. Saket Kumar (M.Sc., Ph.D. in Plant Biotechnology) is an Assistant Professor in Department of Agriculture, K.P.S. Degree College Kakarua (Maheshpura) Lalitpur that affiliated to Bundelkhand University Jhansi. He has 4 years experience in plant sciences. He has published 14 research articles, 06 review papers and 05 book chapters and 02 magazines in scientific Journals.



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Dr. Paritosh Kumar (M.Sc., Ph.D.) presently working as an Assistant Professor-cum-Junior Scientist (Plant Pathology) at Jute Research Station (JRS) Katihar, under Bihar Agricultural University, Sabour, Bhagalpur since November 2024. Previously, he worked as an Assistant Professor-cum-Junior Scientist at T.M. Agriculture College, Godda, under Birsa Agricultural University, Ranchi, Jharkhand for five years.



Dr. Dashrath Bhati, an Assistant Professor at ITM University, Gwalior, since February 2021, holds an Ph.D. in Food and Nutrition from MPUAT, Udaipur. She is a recipient of UGC's Dr. S. Radhakrishnan Post Doctoral Fellowship and conducted research at GBPUAT, Pantnagar. With over 8 years of teaching and research experience, her expertise includes post-harvest management and processing of fruit and vegetable. She has authored 02 books, 03 book chapters, 49 research papers, and actively participated in international workshops on Agribusiness at Israel in collaboration with UNIDO.

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