

Sustainable Agriculture:

A Vision for Resilience Future

Volume I



Editors

M. H. Chavda
Y. B. Vala
C. K. Patel
P. P. Chaudhari
D. K. Patel

Kripa Drishti Publications, Pune.

SUSTAINABLE AGRICULTURE:

A VISION FOR RESILIENCE FUTURE

Volume I

Editors

M. H. Chavda

Research Associate, Department of Agronomy,
B. A. College of Agriculture, Anand Agricultural University,
Anand, Gujarat.

Y. B. Vala

Young Professional-II,
ICAR-NICRA Project, Krishi Vigyan Kendra,
Sardarkrushinagar Dantiwada Agricultural University,
Banaskantha-I, Deesa, Gujarat.

C. K. Patel

Associate Director of Research, Directorate of Research,
Sardarkrushinagar Dantiwada Agricultural University,
Sardarkrushinagar, Banaskantha, Gujarat.

P. P. Chaudhari

Research Scientist, Agro Forestry Research Station,
Sardarkrushinagar Dantiwada Agricultural University,
Sardarkrushinagar, Banaskantha, Gujarat.

D. K. Patel

Associate Professor and Head,
State Council of Agricultural Universities,
Krishibhavan, Gandhinagar, Gujarat.

Kripa-Drishti Publications, Pune.

Book Title: **Sustainable Agriculture: A Vision for Resilience Future**

Edited By: **M. H. Chavda**
Y. B. Vala
C. K. Patel
P. P. Chaudhari
D. K. Patel

Volume I

Price: ₹599

ISBN: 978-81-968830-1-0



Published: August 2024

Publisher:



Kripa-Drishti Publications

A/ 503, Poorva Height, SNO 148/1A/1/1A,
Sus Road, Pashan- 411021, Pune, Maharashtra, India.
Mob: +91-8007068686
Email: editor@kdpublications.in
Web: <https://www.kdpublications.in>

© **Copyright M. H. Chavda, Y. B. Vala, C. K. Patel, P. P. Chaudhari, D. K. Patel**

All Rights Reserved. No part of this publication can be stored in any retrieval system or reproduced in any form or by any means without the prior written permission of the publisher. Any person who does any unauthorized act in relation to this publication may be liable to criminal prosecution and civil claims for damages. [The responsibility for the facts stated, conclusions reached, etc., is entirely that of the author. The publisher is not responsible for them, whatsoever.]

About the Editors



Dr. M. H. Chavda

Dr. M. H. Chavda is currently working as a Research Associate in Department of Agronomy, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat. He has received his B.Sc. (Agri.) degree from Anand Agricultural University, Anand, Gujarat. Subsequently completed his M.Sc. (Agri.) and Ph.D. (Agri.) in Agronomy from Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. Dr. Chavda has garnered extensive experience in the field, having previously worked as a Senior Research Fellow at the Centre for Research on Integrated Farming Systems for over six months. His current responsibilities include teaching, training, and farm management activities. His outstanding contributions to Agronomy have been recognized with the Best Ph.D. Thesis Award and the Young Agronomist Award at an international conference. He has published 15 research papers in prestigious international and national scientific journals, authored one book, and contributed ten book chapters, 14 abstracts, and 15 popular articles. He has actively participated in numerous state, national, and international level seminars, conferences, workshops and training programs, where he has presented both posters and papers. Dr. Chavda also serves as a reviewer for a scientific journal and a magazine and is a member of five esteemed professional societies. His research expertise in organic and Natural farming including intercropping highlights his comprehensive and advanced understanding of agronomy, establishing him as a distinguished and versatile professional in the field.



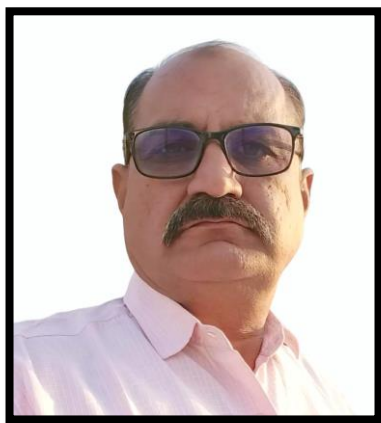
Mr. Y. B. Vala

Mr. Y. B. Vala is currently working as a Young Professional-II in the ICAR-NICRA Project at Krishi Vigyan Kendra, S. D. Agricultural University, Banaskantha-I, Deesa, Gujarat. He is also pursuing his Ph.D. in the Department of Agronomy at C. P. College of Agriculture, SDAU, Sardarkrushinagar, Gujarat. He has received his B.Sc. (Agri.) degree from Anand Agricultural University, Anand, Gujarat and M.Sc. (Agri.) in Agronomy from Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. With over 3 years of outstanding experience in agricultural research, teaching and extension, Mr. Vala is actively involved in research, teaching, training and general extension activities. His primary focus is on developing climate-resilient villages under the ICAR-NICRA Project. He has published 12 research papers in international and national high repute scientific journals. Also he has published 25 abstracts, 1 lead paper and 1 success story in international and national conferences/seminars. His published works include 3 books, 18 book chapters, 14 leaflets/Folders and 23 articles in English/Hindi/Gujarati languages. He has also prepared 3 training manuals, 2 practical manuals and 4 annual reports. As a member of 5 professional societies, he has also serves as reviewers for one journal and one magazine. Additionally, he has participated and attended in numerous seminars, conferences, conclave, workshop, trainings and symposium at state, national and international level, where he has presented various papers and posters. He has also served as a convener and co-convener for state and national level agricultural events. Recognition of his contributions includes many prestigious awards such as Young Professional Award and Best Research Scholar Award for his outstanding contribution in the field of Agronomy. Additionally, he has received best oral and poster presentation award at several national and international agricultural events. He has well experience of research in Organic, Biodynamic and Natural farming, Turmeric cultivation, NRM and Climate Change. His innovative practices, extensive publications, numerous awards and impactful training programs have significantly advanced youth empowerment in agriculture. Through his visionary leadership and steadfast dedication, He has significantly shaped the future of youth in agriculture, promoting sustainable practices and innovative approaches.



Dr. C. K. Patel

Dr. C. K. Patel currently holds the esteemed position of Associate Director of Research at Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. Also, he served as Research Scientist at the Centre for Natural Resources Management at SDAU and he is currently the Nodal Officer for Organic and Natural Farming at the University. With an extensive experience of more than 30 years in Teaching, Research, and Extension in the field of Agriculture, he has successfully executed more than 15 projects. He published 80 research papers in international and national high repute scientific journals. He has published 04 books, 25 book chapters, 20 leaflets/Folders, 55 abstracts and 22 articles in English/Hindi/Gujarati languages. He has attained/participated in several state/national/ international level seminar/conference/workshop/training/symposium and presented many of posters, papers and delivered lead lectures. He is an also organizing secretary of such state level event also conveners and members in national level agricultural events. He broadcasted 30 TV talks on prestigious TV channels. He had guided more than 12 masters and 03 Ph. D. Students. Recognition of his contributions includes many prestigious awards such as the Royal Netherlands Fellowship International Award, which he has been honored with twice in 2002 and 2010. He had various positions with diversified roles and responsibilities in several committees/councils of SDAU and SAUs. He has well experience of research in organic and natural farming, Rainfed and Dry land Agriculture, Pulses, Cotton, Potatoes and Turmeric cultivation, MIS, NRM and Climate Change. As Principal Investigator (PI) and Co-PI, he has led more than 15 projects, offering valuable insights and several recommendations to the farming and scientific communities, thereby shaping agricultural practices and policies. His steadfast commitment and holistic approach continue to inspire and advance agricultural research and development.



Dr. P. P. Chaudhari

Dr. P. P. Chaudhari is currently serving as the Research Scientist at Agro Forestry Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. With over 23 years experience of Teaching, Research and Extension in the field of Agronomy, He has received Associated scientist in the Best AICRP (Potato) Centre Award for the year 2009 for outstanding contribution in the field of Potato Research in Gujarat. He published 38 research papers in international and national high repute scientific journals. He has published 01 books, 05 book chapters, 14 booklet/Folders, 5 abstracts in International Conferences, 16 abstracts in National Conferences/Symposiums. He has attended 5 international conferences, 9 seminars, 4 Institute Trainings, 11 workshops, 7 national conference/symposium. He has guided several PG students of Agronomy including 16 M. Sc. (Agri.) and 3 Ph.D. students. As Principal Investigator (PI) and Co-PI, Dr. Chaudhari has spearheaded over 08 recommendations for farming community. His unwavering dedication and comprehensive approach continue to drive and elevate advancements in agricultural research and development.



Dr. D. K. Patel

Dr. D. K. Patel currently holds the position of Associate Professor and Head, State Council of Agricultural Universities, Krishibhavan, Gandhinagar, Gujarat. With over 33 years of dedicated experience in teaching, research, and extension Dr. Patel is a leading figure in the field and Administration. From his role as an Agriculture Supervisor to his advancement to Associate Professor, he has been instrumental in various key areas of agricultural development and university administration. His significant contributions include All India Coordinated Research Project (AICRP) for Dryland Agriculture and pioneering research on drip irrigation techniques for arid fruit crops. He also developed and secured approval from the Government of Gujarat for the “Project on Floriculture,” enhancing the state's agricultural initiatives. As a Technical Officer of Joint/Additional Secretary of the Government of Gujarat, he played a crucial role in establishing and strengthening a separate Agriculture Council office and managing a wide range of responsibilities, including scheme approvals, project planning, new constructions, and the establishment of a new colleges. He oversaw PG admissions, participated in Universities Board meetings, and coordinated with other State Agricultural Universities. He held various roles in committees and councils at SAUs, KU and Gujarat Natural Farming Science University. He has received best thesis award for his Ph. D. Thesis by GAAS, Gujarat. He published 20 research papers in international and national high reputed scientific journals. He has published 02 books, 07 book chapters, 15 booklets/ Folders, 12 abstracts in International and National Conferences/ Symposiums/ Seminars. He has attended 17 international and National conferences/seminars. He has guided several PG students of Agronomy including 09 M. Sc. (Agri.) and 01 Ph.D. students. He has well experience of research in Intercropping, Rainfed and Dry land Agriculture, Pulses, Arid fruits and Fodder production. As Principal Investigator (PI) and Co-PI, he has spearheaded over 08 recommendations that have influenced farming community. Overall, his contributions have been vital in advancing both agricultural research and university administration.

PREFACE

In the face of accelerating environmental challenges and a growing global population, the imperative for sustainable agriculture has never been more pressing. As we stand at the crossroads of agricultural development, we are compelled to rethink our approach to food production and land stewardship. "**Sustainable Agriculture: A Vision for Resilience Future**" emerges as a beacon of hope amidst these uncertainties, offering a roadmap towards a harmonious coexistence between humanity and nature.

This book is not merely a compilation of practices or theories; it is a manifesto for change, a call to action for all stakeholders in the agricultural ecosystem. Grounded in the principles of ecological balance, social equity, and economic viability, our vision for sustainable agriculture transcends conventional boundaries. It embraces innovation while honoring traditional wisdom, fostering collaboration across disciplines and generations.

Within these pages, you will encounter diverse perspectives, from seasoned agronomists to indigenous knowledge keepers, each contributing a unique thread to the tapestry of sustainable agriculture. We delve into the intricacies of regenerative farming, agroecology, and permaculture, exploring how these methodologies can nurture both the land and the communities that depend on it.

Moreover, this book is a testament to resilience, a quality indispensable in navigating the uncertainties of the future. Through case studies and success stories from around the globe, we witness the transformative power of sustainable agriculture in building resilient food systems capable of withstanding shocks and stresses, be they climatic, economic, or social.

As editors of this book, we are deeply moved and humbled by the collective wisdom and commitment of the dedicated contributors who have poured their passion into these pages. We invite you, dear reader, to embark on this sustainable journey with us. A journey towards a future where agriculture thrives in harmony with nature, where every seed sown is a promise of abundance for generations to come.

May this book serve as a guiding light for policymakers, farmers, educators, research scholars and consumers alike, inspiring us all to cultivate a more sustainable, resilient, and equitable world through the transformative power of agriculture.

“Together, let us sow the seeds of change and reap a harvest of hope.”

M. H. Chavda
Y. B. Vala
C. K. Patel
P. P. Chaudhari
D. K. Patel

Acknowledgment

The journey of bringing "**Sustainable Agriculture: A Vision for Resilience Future**" to fruition has been one marked by the collaboration, inspiration and unwavering support of many remarkable individuals and organizations. It is with deep gratitude that we acknowledge their contributions, which have been instrumental in shaping this work.

First and foremost, we wish to extend our heartfelt thanks to our family for their unwavering support and encouragement throughout this period. To the esteemed experts, researchers, educators and practitioners in the field of sustainable agriculture, your pioneering work and tireless efforts have laid the groundwork for this book. A special thank you goes to the reviewers and contributors who provided invaluable feedback and constructive criticism. Your suggestions have helped refine and enhance the vision presented here.

We are profoundly grateful to the Sardarkrushinagar Dantiwada Agricultural University, Gujarat for its pivotal role in the development of this book. SDAU unwavering commitment to advancing sustainable practices and research has been instrumental in shaping the vision presented here. We're truly grateful.

To all chapter authors and publishing team, your professionalism and attention to detail have ensured that this book reaches its full potential. We sincerely appreciate your dedication and hard work. Thank you.

Lastly, we would like to acknowledge the broader community of individuals and communities working towards sustainable agriculture. Your passion and resilience continue to inspire and drive positive change in the world.

Finally, to you, the readers, who embark on this journey with us, we extend our deepest appreciation. Your interest and engagement are the driving forces behind this work. This book is a testament to the collective effort of many, and we honored to contribute to the ongoing dialogue on building a resilient and sustainable future.

[Editors]

CONTENT

| | |
|---|-----------|
| 1. Sustainable Agriculture: An Overview - S. N. Makwana, C. S. Chaudhary, S. B. Bhuvela, Priyanka Choudhary..... | 1 |
| 1.1 Introduction:..... | 1 |
| 1.2 Evolution of Sustainable Agriculture:..... | 3 |
| 1.3 Sustainable Agriculture Systems:..... | 4 |
| 1.3.1 Community Sustainability:..... | 4 |
| 1.4 Importance of Sustainable Agriculture:..... | 9 |
| 1.4.1 Advantages of Sustainable Agriculture:..... | 11 |
| 1.4.2 Disadvantages of Sustainable Agriculture:..... | 11 |
| 1.5 Conclusion:..... | 12 |
| 1.6 References:..... | 12 |
| | |
| 2. Sustainable Agriculture: The Global Scenario - V. G. Tala, R. U. Chaudhari, A. B. Dhola, A. S. Patel | 15 |
| 2.1 How Do We Achieve Sustainability?..... | 18 |
| 2.2 Sustainable Agriculture's Impact Evidence in India:..... | 19 |
| 2.3 Key Emerging Themes in India's Sustainable Agriculture:..... | 20 |
| 2.4 Way Forward to Scale-Up Sustainable Agriculture in India:..... | 20 |
| 2.5 Sustainable Agriculture – Challenges:..... | 22 |
| 2.5.1 Government Initiatives:..... | 22 |
| 2.5.2 Other Initiatives:..... | 23 |
| 2.5.3 Challenges to Sustainable Agriculture in India:..... | 23 |
| 2.6 Strategies for Making Agriculture More Sustainable:..... | 23 |
| 2.6.1 Sustainable Agriculture – Advantages:..... | 24 |
| 2.7 Conclusion:..... | 24 |
| 2.8 References:..... | 25 |
| | |
| 3. Sustainable Agriculture: A Challenge for Indian Agriculture in the 21st Century - A. B. Dhola, A. S. Patel, V. G. Tala, K. N. Raval..... | 26 |
| 3.1 Introduction:..... | 26 |
| 3.2 Agricultural Challenges:..... | 27 |
| 3.2.1 Depletion of Water Resources through Overexploitation:..... | 28 |
| 3.2.2 Erosion of Ecological Harmony and Diminishing Crop Diversity:..... | 29 |
| 3.2.3 Growth Driven by Price Factors and Inefficiency:..... | 29 |
| 3.2.4 Regional Disparities and Unbalanced Agricultural Development:..... | 30 |
| 3.2.5 Inefficient Allocation of Resources and Unproductive Investments:..... | 31 |

| | |
|--|----|
| 3.2.6 Innovation in Technology: Creation and Diffusion Challenges | 31 |
| 3.2.7 Sustainability of Smallholder Farming Enterprises: | 32 |
| 3.2.8 Nutrition, Food Safety, and Health Concerns:..... | 32 |
| 3.2.9 Discrepancies between Structural Shifts in Output and Workforce Dynamics:..... | 33 |
| 3.2.10 Persistent Low Incomes Amongst Agricultural Practitioners: | 33 |
| 3.3 Conclusion: | 34 |
| 3.4 References:..... | 34 |

4. Organic Farming: Present Need of Generation for Better Tomorrow -

M. H. Chavda, Y. B. Vala, P. P. Chaudhari, C. K. Patel, D. K. Patel **35**

| | |
|---|----|
| 4.1 Definition and Concept of Organic Farming: | 36 |
| 4.1.1 History of Organic Farming: | 38 |
| 4.1.2 Key Milestones on Organic Farming: | 39 |
| 4.1.3 What is Organic Farming System? | 39 |
| 4.1.4 Principles of Organic Agriculture: | 40 |
| 4.1.5 The Objectives of Organic Agriculture as Per the Document of IFOAM Are: | 40 |
| 4.1.6 Benefits of Organic Farming: | 41 |
| 4.1.7 Constraints / Limitations of Organic Farming in India: | 41 |
| 4.1.8 Conventional Farming Vs Organic Farming Difference:..... | 42 |
| 4.2 Soil Fertility and its Management in Organic Farming: | 43 |
| 4.2.1 Soil Fertility Management: | 43 |
| 4.3 Role of Different Sources of Organic Nutrient: | 44 |
| 4.3.1 Organic Manures:..... | 44 |
| 4.3.2 Advantages of Manuring: | 45 |
| 4.4 Vermicomposting: | 49 |
| 4.4.1 Definition:..... | 49 |
| 4.4.2 Vermiculture: | 50 |
| 4.4.3 Vermiwash:..... | 50 |
| 4.4.4 Benefits of Vermicompost:..... | 50 |
| 4.5 Green Manuring: | 50 |
| 4.5.1 Advantages of Green Manuring:..... | 51 |
| 4.5.2 Desirable Characteristics for Green Manure Crops: | 51 |
| 4.6 Panchagavya: A Liquid Fertilizer for Organic Farming | 51 |
| 4.6.1 Ingredients Used for Preparation of Panchagavya: | 52 |
| 4.6.2 Protocol for Panchgavya Preparation:..... | 52 |
| 4.6.3 Advantages of Panchagavya: | 52 |
| 4.7 Recycling of Organic Residues: | 53 |
| 4.7.1 Methods of Recycling: | 53 |
| 4.8 Bio-Fertilizers (Microbial Inoculants):..... | 54 |
| 4.8.1 Enrichment of Compost with Microbial Inoculants:..... | 54 |
| 4.8.2 Benefits of Bio- Fertilizers in Organic Farming: | 54 |
| 4.8.3 Types of Bio-fertilizers: | 54 |
| 4.8.4 Liquid Bio fertilizers: | 55 |

| | |
|---|----|
| 4.8.5 The Concept of Liquid Bio Fertilizers: | 55 |
| 4.8.6 Benefits:..... | 55 |
| 4.9 Weed Management Under Organic Farming: | 56 |
| 4.9.1 What Is Organic Weed Management? | 56 |
| 4.9.2 Principles of Weed Control in Organic Farming:..... | 56 |
| 4.9.3 Different Methods of Weed Management in Organic Farming: | 57 |
| 4.9.4 Limitations of Biological Control in Weed Management:..... | 60 |
| 4.10 Organic Certification- Standards and Agencies:..... | 60 |
| 4.10.1 What Is Organic Certification?..... | 60 |
| 4.10.2 Certification and Accreditation:..... | 61 |
| 4.10.3 Organic Certification:..... | 62 |
| 4.10.4 Certification Process: | 62 |
| 4.10.5 Certification Procedure in Brief:..... | 63 |
| 4.10.6 An Accreditation:..... | 63 |
| 4.10.7 Certification System in India:..... | 64 |
| 4.10.8 Products Used in Fertilization and Soil Conditioning in Organic Farming: | 64 |
| 4.10.9 Limitation of Organic Market in India:..... | 65 |
| 4.10.10 Strategy to Be Taken for Market Improvement:..... | 65 |
| 4.11 Conclusion: | 65 |
| 4.12 References:..... | 66 |

5. Biodynamic Farming: - Concepts, Principles and Application - Y. B. Vala, M. H. Chavda, C. K. Patel, M. G. Chaudhary, K. R. Solanki.....67

| | |
|---|----|
| 5.1 Introduction:..... | 68 |
| 5.2 Challenges faced by Small & Marginal Farmers in India: | 71 |
| 5.3 History of Biodynamic Agriculture:..... | 72 |
| 5.3.1 Differences Between Organic Farming and Biodynamic Farming: ..74 | |
| 5.3.2 Features of Biodynamic Farming: | 74 |
| 5.4 Core Concepts and Factors of Biodynamic Farming: | 75 |
| 5.5 Rewards of Biodynamic Farming: | 77 |
| 5.6 Biodynamic Preparations:..... | 78 |
| 5.6.1 BD 500 Cow Horn Manure: | 80 |
| 5.6.2 BD 502 Yarrow (<i>Achillea Millefolium</i>): | 82 |
| 5.6.3 BD 503 Chamomile (<i>Matricaria Chamomilla</i>):..... | 83 |
| 5.6.4 BD 504 Himalayan Stinging Nettle (<i>Urtica Parviflora</i>):..... | 84 |
| 5.6.5 BD 505 Himalayan Oak Bark (<i>Quercus Glauca</i>):..... | 85 |
| 5.6.6 BD 506 Dandelion (<i>Taraxicum Officinalis</i>):..... | 86 |
| 5.6.7 BD 507 Valerian (<i>Valeriana Officinalis</i>):..... | 86 |
| 5.6.8 BD 508 (<i>Equisetum Arvense</i>): | 87 |
| 5.7 Cow Pat Pit: | 88 |
| 5.8 Biodynamic Compost: | 89 |
| 5.9 Liquid Manures: | 90 |
| 5.10 New Moon-Full Moon:..... | 92 |
| 5.10.1 Moon Opposite Saturn: | 92 |

| | |
|---|----|
| 5.10.2 Ascending and Descending Moon: | 93 |
| 5.10.3 Moon Nodes:..... | 94 |
| 5.10.4 Apogee and Perigee:..... | 94 |
| 5.10.5 Moon in Zodiac Constellations: | 95 |
| 5.11 Biodynamic Way of Disease and Pest Management: | 98 |
| 5.12 Limitations of Biodynamic Farming: | 98 |
| 5.13 Conclusion: | 98 |
| 5.14 References: | 99 |

6. Natural Farming: Low Input Based Ecological Farming - M. G. Chaudhary, M. H. Chavda, Y. B. Vala, C. K. Patel, L. J. Desai..... 101

| | |
|---|-----|
| 6.1 Introduction: | 102 |
| 6.2 Natural Farming: Future of Agriculture: | 102 |
| 6.2.1 History of Natural Farming: | 103 |
| 6.2.2 Pioneers of Natural Farming in Modern India:..... | 104 |
| 6.2.3 Honorable Prime Minister's Vision for Promotion of Natural Farming: | 104 |
| 6.2.4 What Is Natural Farming? | 105 |
| 6.2.5 Is Natural Farming Better Than 'Conventional' Farming? | 106 |
| 6.2.6 Natural Farming: The Way Forward..... | 106 |
| 6.2.7 Major Objectives of Natural Farming:..... | 108 |
| 6.2.8 Concept of Natural Farming: | 108 |
| 6.2.9 Features of Natural Farming:..... | 109 |
| 6.2.10 Principles of Natural Farming:..... | 109 |
| 6.2.11 Can Be Achieved Through Following Specific Principles:..... | 110 |
| 6.2.12 Scope of Natural Farming:..... | 110 |
| 6.2.13 Importance of Natural Farming: | 110 |
| 6.2.14 Benefits of Natural Farming: | 110 |
| 6.2.15 The World of Natural Farming- Cattle and Non-Cattle Based: | 112 |
| 6.3 Comparisons with Organic Agriculture:..... | 112 |
| 6.3.1 Current Scenario of Natural Farming in India: | 112 |
| 6.3.2 Prospects and Challenges of Natural Farming:..... | 113 |
| 6.3.3 Components of Natural Farming: | 113 |
| 6.4 On Farm Input Production and Methodology: | 116 |
| 6.4.1 Bijamrut:..... | 116 |
| 6.4.2 Jivamrut: | 117 |
| 6.5 Science Behind the Technique: | 119 |
| 6.5.1 Ghan Jiwamrita: | 119 |
| 6.5.2 It Increases the Count of Earthworms in Soil Which Is Beneficial for Soil Fertility..... | 120 |
| 6.6 Some Other Pest Control Formulations: | 121 |
| 6.6.1 Dashparni Extract:..... | 121 |
| 6.6.2 Tutikadaresam:..... | 122 |
| 6.6.3 Sonthastra: | 122 |
| 6.6.4 Jungle Ki Kanddi: | 122 |

| | |
|----------------------|-----|
| 6.7 References:..... | 122 |
|----------------------|-----|

7. Integrated Farming System: A Comprehensive Strategy to Boost Farmer's Income - Parikunwar L. Parmar, Preeti H. Dave.....124

| | |
|---|-----|
| 7.1 Introduction:..... | 124 |
| 7.2 What is Integrated Farming System? | 126 |
| 7.2.1 Components of Integrated Farming Systems: | 127 |
| 7.2.2 Role of Integrated Farming Systems in Climate Change Mitigation and Adaptation: | 127 |
| 7.3 Let's Look Back into History: | 128 |
| 7.4 Effect of Climate Change on Farming:..... | 129 |
| 7.4.1 Role of Integrated Farming Systems in Climate Change Mitigation and Adaptation: | 130 |
| 7.4.2 Adaptation Strategies: | 131 |
| 7.5 Why We Need Integrated Farming System? | 132 |
| 7.5.1 The Need for Integration: | 132 |
| 7.6 What Has Been Done So Far?..... | 133 |
| 7.7 What Are the Challenges? | 135 |
| 7.8 What Can Be Done Next?..... | 136 |
| 7.9 How Can We Contribute?..... | 138 |
| 7.10 Conclusion: | 140 |
| 7.11 References:..... | 140 |

8. On Farm Waste Recycling Techniques - K. A. Solanki, S. H. Malve, D. M. Solanki, Y. B. Vala.....141

| | |
|--|-----|
| 8.1 Introduction:..... | 142 |
| 8.2 Scenario of Agricultural Waste in India and World Level: | 143 |
| 8.2.1 Impacts of Agricultural Waste:..... | 143 |
| 8.2.3 National Schemes and Policies:..... | 143 |
| 8.3 Why Waste Management Is Important? | 144 |
| 8.3.1 Waste Management:..... | 145 |
| 8.3.2 On farm Waste:..... | 145 |
| 8.3.3 Benefits of on Farm Waste Management: | 146 |
| 8.3.4 Types of Agricultural Waste..... | 146 |
| 8.4 Crop Residues: | 147 |
| 8.4.1 Crop Residue Generation: | 147 |
| 8.4.2 Residues Burning in India: | 149 |
| 8.4.3 Availability of Vegetable and Fruit Waste:..... | 149 |
| 8.5 Solid Manure (Cow Dung) Contains:..... | 151 |
| 8.6 Greenhouse Gas Emission: | 151 |
| 8.7 Crop Residue Incorporation:..... | 153 |
| 8.8 Surface Retention and Mulching:..... | 153 |
| 8.9 Composting:..... | 154 |
| 8.9.1 Types of Composting: | 155 |

| | |
|---------------------------------|-----|
| 8.10 Vermicomposting | 158 |
| 8.11 Biogas Technology:..... | 160 |
| 8.12 Pyrolysis:..... | 160 |
| 8.12.1 Types of Pyrolysis:..... | 161 |
| 8.13 Biochar:..... | 161 |
| 8.14 Study Findings:..... | 162 |
| 8.14.1 Crop Residues | 162 |
| 8.14.2 Vermicompost:..... | 163 |
| 8.14.3 Biochar: | 163 |
| 8.14.4 Biogas | 164 |
| 8.14.5 Compost..... | 164 |
| 8.15 Conclusion: | 164 |
| 8.16 Reference: | 165 |

9. Sustainable Dry Land Agriculture - H. N. Chaudhary, M. A. Chaudhary, V. B. Gohil, K. V. Chaudhary 167

| | |
|--|-----|
| 9.1 Introduction and Definitions of Dry Land Agriculture: | 167 |
| 9.2 What Is the Difference Between Dry Farming, Dry Land Farming and Rainfed Farming?..... | 168 |
| 9.3 What Is the Present Status of Dry Land Farming? | 169 |
| 9.4 What Is the Contribution of Dry Land Farming? | 170 |
| 9.5 Advantages and Disadvantages of Dry Land Farming:..... | 170 |
| 9.5.1 Advantages: | 170 |
| 9.5.2 Disadvantages: | 171 |
| 9.6 What Are the Problems and Challenges of Dry Land Farming in India?..... | 171 |
| 9.7 How to Mitigation Drought? And Define Crop Adaptation: | 175 |
| 9.7.1 Crop Adaptations: | 176 |
| 9.8 What Are the Strategies for The Development of Dry Land Farming? | 178 |
| 9.9 What Are the Government Initiatives for Dry Land Farming?..... | 179 |
| 9.10 What Should Be the Future Course of Action?..... | 180 |
| 9.11 Conclusion: | 180 |
| 9.12 References:..... | 180 |

10. Rain Water Harvesting and Water Saving Techniques in Dry Land Agriculture - V. B. Gohil, H. N. Chaudhary, M. A. Chaudhari, S. F. Chaudhary 182

| | |
|---|-----|
| 10.1 Introduction: | 182 |
| 10.2 History of Water Harvesting: | 183 |
| 10.2.1 The Concept of Water Harvesting: | 185 |
| 10.2.2 Overview of Water Harvesting Techniques: | 188 |
| 10.2.3 Rooftop Water Harvesting:..... | 188 |
| 10.2.4 Microcatchment Water Harvesting: | 189 |
| 10.2.5 Macrocatchment Water Harvesting:..... | 196 |
| 10.2.6 Large Catchment Water Harvesting:..... | 196 |

| | |
|---|------------|
| 10.2.7 Groundwater Harvesting: | 197 |
| 10.2.8 Benefits of Water Harvesting: | 198 |
| 10.3 Conclusions and Future Research Thrusts: | 201 |
| 10.4 References: | 202 |
| | |
| 11. Micro Irrigation: A Key to Enhancing Water Use Efficiency in Agriculture - Prajapati V. B., Varnekar K. D., Desai L. J. | 205 |
| 11.1 Introduction: | 206 |
| 11.2 What Is Micro-Irrigation? | 207 |
| 11.2.1 Why Micro-Irrigation Have to Be Adopted? | 207 |
| 11.2.2 Suitability of Micro-Irrigation: | 207 |
| 11.2.3 Features of Micro Irrigation System: | 207 |
| 11.2.4 Classification of Micro Irrigation System: | 208 |
| 11.3 Conclusion: | 219 |
| 11.4 References: | 219 |
| | |
| 12. Role of Rainfed Agriculture in Sustainable Transformation - R. U. Chaudhari, V. G. Tala, U. M. Patel, Ravi D. Patel | 221 |
| 12.1 Introduction: | 222 |
| 12.2 Rainfed Agriculture: | 222 |
| 12.2.1 History of Rainfed Agriculture and Watershed in India: | 223 |
| 12.2.2 Types of Rainfed Agriculture: | 224 |
| 12.2.3 Importance of Rainfed Agriculture: | 226 |
| 12.2.4 Sustainable Rainfed Agriculture Practices: | 226 |
| 12.2.5 Government Policies and Support: | 227 |
| 12.2.6 Research and Innovation: | 227 |
| 12.2.7 Challenges in Rainfed Agriculture: | 227 |
| 12.2.8 Opportunities: | 228 |
| 12.3 Sustainable Agriculture: | 228 |
| 12.3.1 What Is Sustainable Agriculture? | 228 |
| 12.3.2 Why Is Sustainable Agriculture So Important? | 228 |
| 12.3.3 What Are Seven Sustainable Agricultural Practices? | 229 |
| 12.3.4 What Are Some Examples of Sustainable Agriculture? | 230 |
| 12.4 Indian Agriculture: Policies for Sustainable Transformation | 230 |
| 12.4.1 National Mission for Sustainable Agriculture (NMSA): | 231 |
| 12.4.2 Pradhan Mantri Krishi Sinchayee Yojana (PMKSY): | 234 |
| 12.4.3 Pradhan Mantri Fasal Bima Yojana (PMFBY): | 236 |
| 12.5 What Are the Benefits of Sustainable Agriculture? | 237 |
| 12.6 Sustainable Agriculture Versus Industrial Agriculture: | 238 |
| 12.7 What Are the Current Greatest Threats to Agricultural Sustainability? | 238 |
| 12.8 Conclusion: | 238 |
| 12.9 References: | 239 |

| | |
|--|------------|
| 13. Conservation Agriculture Under Changing Climate - R. J. Patel, K. V. Chaudhary..... | 240 |
| 13.1 What Is Conservation Agriculture? | 240 |
| 13.1.1 Objectives of Conservation Agriculture:..... | 242 |
| 13.1.2 Why Adopt Ca Practices?..... | 243 |
| 13.1.3 Advantages of Conservation Agriculture: | 244 |
| 13.2 Climate Change Mitigation and Adaptation: | 246 |
| 13.2.1 Challenges in Conservation Agriculture: | 247 |
| 13.3 Policy Issues Required for Conservation Agriculture: | 248 |
| 13.4 Conclusion: | 249 |
| 13.5 References: | 249 |
| | |
| 14. Climate Smart Agriculture for Sustainable Livelihood - A. S. Patel, A. B. Dhola, K. N. Raval, R. B. Rathod | 251 |
| 14.1 Introduction: | 251 |
| 14.2 Climate Change and Agriculture:..... | 252 |
| 14.3 Significance of Climate Smart Agriculture:..... | 253 |
| 14.3.1 Principles of Climate Smart Agriculture: | 254 |
| 14.4 Framework for Sustainable Livelihood: | 255 |
| 14.5 Key Components of Climate-Smart Agriculture:..... | 256 |
| 14.6 Examples of Communities Benefiting from Sustainable Livelihood Through | 258 |
| 14.7 Future Directions and Innovation:..... | 259 |
| 14.8 Challenges and Opportunities: | 261 |
| 14.9 Conclusion: | 263 |
| 14.10 References: | 264 |
| | |
| 15. Emerald Fields: - Organic Agriculture's Frontier in Climate Solutions - K. R. Solanki, Y. B. Vala, M. H. Chavda, D. K. Patel, C. K. Patel | 265 |
| 15.1 Introduction: | 266 |
| 15.2 Why Organic Agriculture?..... | 268 |
| 15.3 The Core Principles of Organic Agriculture Include:..... | 269 |
| 15.4 10 Principles to Advance Organic Farming in Relation to Climate Change: | 269 |
| 15.5 "Organic Farming Innovations: Navigating Climate Change Challenges" . | 270 |
| 15.6 Recent Techniques in Organic Agriculture Under Changing Climate: | 272 |
| 15.7 Recent Trends in Organic Farming in Relation to Climate Change:..... | 273 |
| 15.8 Minimum Disturbance of Soil:..... | 274 |
| 15.9 Better Use of Season's Rainfall:..... | 276 |
| 15.10 Natural Farming in Context to Climate Change:..... | 278 |
| 15.10.1 Recent Trends in Natural Farming Practices Under Changing Climate: | 279 |
| 15.10.2 Use of Biostimulants: | 281 |

15.11 Key Principles Points in Natural Farming Under Climate Change:.....284
15.12 Conclusion:284
15.13 Reference:285

ABOUT THE BOOK

Welcome to a journey into the heart of sustainability. A journey that transcends the mere cultivation of crops to embrace a profound ethos of stewardship and resilience. **"Sustainable Agriculture: A Vision for Resilience Future"** is not just a book; it's a manifesto for change, a testament to our collective commitment to nourishing the planet while safeguarding its future.

In the pages that follow, we embark on a journey of exploration and discovery. A journey that transcends the boundaries of conventional farming to embrace a holistic vision of sustainability. Here, sustainability is not merely a buzzword; it is a guiding principle, a moral imperative, and a beacon of hope in a world beset by environmental challenges and social inequalities. This book is more than just a compendium of practices and techniques; it is a call to action—a call to reimagine agriculture as a force for positive change in the world. So, dear reader, I invite you to join us on this journey—a journey towards a future where agriculture is not just sustainable, but regenerative; not just productive, but enriching; not just a means of survival, but a celebration of life in all its diversity and abundance.

For policymakers, farmers, students, educators, researcher and consumers alike, **"Sustainable Agriculture: A Vision for Resilience Future"** offers inspiration, guidance, and a roadmap towards a brighter tomorrow one where agriculture becomes a beacon of hope and healing for the planet and all its inhabitants.



Kripa-Drishti Publications

A-503 Poorva Heights, Pashan-Sus Road, Near Sai Chowk,
Pune - 411021, Maharashtra, India.

Mob: +91 8007068686

Email: editor@kdpublishations.in

Web: <https://www.kdpublishations.in>

Price: ₹ 599

ISBN: 978-81-968830-1-0

