

# Mechanization Of Conservation Agriculture For Smallholders

This book is a printed edition of the Special Issue "Sustainable Agriculture—Beyond Organic Farming" that was published in Sustainability

The manual work carried out by farmers and their families is often both arduous and time consuming and in many countries this is a major constraint to increasing agricultural production. Such day-to-day drudgery is a major contributing factor in the migration of people, particularly the young, from the rural countryside to seek the prospect of a better life in the towns and cities. Farm production can be substantially increased through the use of mechanical technologies which both are labor-saving and directly increase yields and production. This document provides guidelines on the development and formulation of an agricultural mechanization strategy and forms part of FAO's approach on sustainable production intensification.

The current report—Mechanized: Transforming Africa's Agriculture Value Chains—summarizes the findings of a systematic analysis of what countries at the forefront of progress in mechanization have done right. It analyzes which policy decisions were taken and which interventions were implemented to substantially increase the uptake of mechanization. The report takes a broad perspective on mechanization, including technologies along the entire value chain and how they relate to agricultural development and job creation. The report shows what can be done to sustainably mechanize agriculture to increase production and enhance value addition across value chain segments. The set of policies and practices that are identified, if brought to scale, could have significant impact on agricultural transformation in Africa. The report provides a roadmap for African governments to take concerted action to deliver on the growth and transformation targets set out by the Malabo Declaration and the Sustainable Development Goals.

Rain forests are rapidly being cleared in the humid tropics to keep pace with food demands, economic needs, and population growth. Without proper management, these forests and other natural resources will be seriously depleted within the next 50 years. Sustainable Agriculture and the Environment in the Humid Tropics provides critically needed direction for developing strategies that both mitigate land degradation, deforestation, and biological resource losses and help the economic status of tropical countries through promotion of sustainable agricultural practices. The book includes A practical discussion of 12 major land use options for boosting food production and enhancing local economies while protecting the natural resource base. Recommendations for developing technologies needed for sustainable agriculture. A strategy for changing policies that discourage conserving and managing natural resources and biodiversity. Detailed reports on agriculture and deforestation in seven tropical countries. This publication gives a wide-ranging perspective on the present state of mechanization in the developing world, and, as such, constitutes a solid platform on which to build strategies for a sustainable future. Farm mechanization forms an integral plank in the implementation of sustainable crop production intensification methodologies and sustainable intensification necessarily means that the protection of natural resources and the production of ecosystem services go hand-in-hand with intensified production practices. This requires specific mechanization measures to allow crops to be established with minimum soil disturbance, to allow the soil to be protected under organic cover for as long as possible, and to establish crop rotations and associations to feed the soil and to exploit crop nutrients from various soil horizons. This work is the starting point to help the reader understand the complexities and requirements of the task ahead.

The book covers the spread of conservation agriculture (CA) to regions including Brazil,

Argentina, Canada, Australia, Europe and emerging CA destinations in Asia and Africa. Topics covered include the various components of CA, and how their individual and combined implementation influence productivity, soil health and environmental quality under diverse edaphic and climatic conditions. The book will be useful to teachers, researchers, extensionists, farmers, and students interested in environmental quality.

"Co-organized by Food and Agriculture Organization of the United Nations (FAO), United Nations Industrial Development Organization (UNIDO). Hosted by Centre for Agricultural Mechanization and Rural Technologies (CAMARTEC), 3-5 June 2009, Arusha, Tanzania." This book showcases a compilation of case studies presented by scientists, teachers and academics and covers contemporary technologies for combating climate change, including sustainable agricultural management practices and conservation agriculture. It highlights the situations that future generations in the Indian Himalayas will face, and addresses the major challenges for tomorrow's generations in their efforts to ensure sufficient food production for the global population. It also sheds light on the factors that are routinely ignored in connection with agricultural management practices for sustainable food production and risk assessment. Lastly, it illustrates the need to develop a comprehensive master plan for strategic planning, including conservation agriculture practices that address poverty and food security in the wake of climate change impacts.

In large parts of the developed and developing worlds soil tillage by plough or hoe is the main cause of land degradation leading to stagnating or even declining production levels and increasing production cost. It causes the soil to become more dense and compacted, the organic matter content to be reduced and water runoff and soil erosion to increase. It also leads to droughts becoming more severe and the soil becoming less fertile and less responsive to fertiliser. This book brings together the key notes lectures and other outstanding contributions of the I World Congress on Conservation Agriculture and provides an updated view of the environment and economic advantages of CA and of its implementation in different areas of the World.

Advances in Organic Farming: Agronomic Soil Management Practices focuses on the integrated interactions between soil-plant-microbe-environment elements in a functioning ecosystem. It explains sustainable nutrient management under organic farming and agriculture, with chapters focusing on the role of nutrient management in sustaining global ecosystems, the remediation of polluted soils, conservation practices, degradation of pollutants, biofertilizers and biopesticides, critical biogeochemical cycles, potential responses for current and impending environmental change, and other critical factors. Organic farming is both challenging and exciting, as its practice of "feeding the soil, not the plant provides opportunity to better understand why some growing methods are preferred over others. In the simplest terms, organic growing is based on maintaining a living soil with a diverse population of micro and macro soil organisms. Organic matter (OM) is maintained in the soil through the addition of compost, animal manure, green manures and the avoidance of excess mechanization. Presents a comprehensive overview of recent advances and new developments in the field OF research within a relevant theoretical framework Highlights the scope of the inexpensive and improved management practices Focuses on the role of nutrient management in sustaining the ecosystems

Given the central role of the food and agriculture system in driving so many of the connected ecological, social and economic threats and challenges we currently face, Rethinking Food and Agriculture reviews, reassesses and reimagines the current food and agriculture system and the narrow paradigm in which it operates. Rethinking Food and Agriculture explores and uncovers some of the key historical, ethical, economic, social, cultural, political, and structural drivers and root causes of unsustainability, degradation of the agricultural environment, destruction of nature, short-comings in science and knowledge systems, inequality, hunger and

food insecurity, and disharmony. It reviews efforts towards 'sustainable development', and reassesses whether these efforts have been implemented with adequate responsibility, acceptable societal and environmental costs and optimal engagement to secure sustainability, equity and justice. The book highlights the many ways that farmers and their communities, civil society groups, social movements, development experts, scientists and others have been raising awareness of these issues, implementing solutions and forging 'new ways forward', for example towards paradigms of agriculture, natural resource management and human nutrition which are more sustainable and just. Rethinking Food and Agriculture proposes ways to move beyond the current limited view of agro-ecological sustainability towards overall sustainability of the food and agriculture system based on the principle of 'inclusive responsibility'. Inclusive responsibility encourages ecosystem sustainability based on agro-ecological and planetary limits to sustainable resource use for production and livelihoods. Inclusive responsibility also places importance on quality of life, pluralism, equity and justice for all and emphasises the health, well-being, sovereignty, dignity and rights of producers, consumers and other stakeholders, as well as of nonhuman animals and the natural world. Explores some of the key drivers and root causes of unsustainability, degradation of the agricultural environment and destruction of nature. Highlights the many ways that different stakeholders have been forging 'new ways forward' towards alternative paradigms of agriculture, human nutrition and political economy, which are more sustainable and just. Proposes ways to move beyond the current unsustainable exploitation of natural resources towards agroecological sustainability and overall sustainability of the food and agriculture system based on 'inclusive responsibility'. Many previous publications on farm mechanization, draught animal power, hand tool technology, etc. have tended to be narrowly focused. The topic of farm power and mechanization also tended to be separated from the actual process of growing crops. This manual looks at putting the different sources of farm power, mechanization, machines, equipment and tools in a much broader context. Farm power requirements need to be viewed with reference to rural livelihoods and to farming systems as well as to the critical area of labour saving in HIV/AIDS-hit populations. No one particular type of technology is advocated. A renewed focus on agriculture's potential contribution to economic transformation in Africa has resulted in increased attention paid to agricultural mechanization. African agriculture still relies predominantly on human muscle power despite anecdotal evidence on urbanization and rising rural wages, in contrast to other developing regions that have experienced rapid increases in agricultural mechanization during the past few decades. Past state-led mechanization pushes in Africa often failed due to insufficient understanding of the nature of demand for mechanization technologies among farmers and insufficient knowledge of private-sector functions. This background paper reviews the factors likely to influence farmer demand for mechanization in Africa and details different existing and potential mechanization supply models. Although an empirical analysis of mechanization demand and the effectiveness of supply chains is beyond the scope of this paper, in part due to data limitations, this paper suggests that demand for mechanization may be emerging in some parts of Africa. It also suggests that private-sector-driven supply models are better positioned to meet this demand than direct government involvement and certain types of subsidized programs. The paper then identifies possible areas for government support to complement private-sector leadership in developing mechanization supply chains. Nevertheless, significant further research is required to better understand the changing nature of mechanization demand in Africa and the extent and effectiveness of different supply models in meeting it.

Conservation agriculture—consisting of four components including permanent soil cover, minimum soil disturbance, diversified crop rotations and integrated weed management—is considered the principal pathway to sustainable agriculture and the conservation of natural resources and the environment. Leading researchers in the field describe the basic principles

of conservation agriculture, and synthesize recent advances and developments in conservation agriculture research. This book is a ready reference on conservation agriculture and reinforces the understanding for its utilization to develop environmentally sustainable and profitable food production systems. The book describes various elements of conservation agriculture; highlights the associated breeding and modeling efforts; analyses the experiences and challenges in conservation agriculture in different regions of the world; and proposes some pragmatic options and new areas of research in this very important area of agriculture. Agriculture in Eastern Europe and Central Asia is diverse, and has great potential to revitalize the economy of the countries in the region via improved productivity (efficiency) and higher total yield for food, fodder and fibre crops. Conservation agriculture can rise to the major challenge of making sustainable intensification of production systems a reality. In order for farmers to transition to appropriate sustainable production systems, the provision of an adequate enabling environment and access to knowledge and services, including extension, mechanization, inputs and market intelligence, are crucial. This Guide is designed to provide coherent technical tools to Farmer Field Schools and extension service facilitators of conservation agriculture. Furthermore, the Guide is suitable for use within universities' agriculture curricula. Sustainable Agricultural Mechanization: A Framework for Africa Food & Agriculture Org. Smart Technologies for Sustainable Smallholder Agriculture: Upscaling in Developing Countries defines integrated climate smart agricultural technologies (ICSAT) as a suite of interconnected techniques and practices that enhance quantity and quality of agricultural products with minimum impact on the environment. These ICSAT are centered on three main pillars, increased production and income, adaptation and resilience to climate change, and minimizing GHG emissions. This book brings together technologies contributing to the three pillars, explains the context in which they can be scaled up, and identifies research and development gaps as areas requiring further investigation. It stresses the urgency in critically analyzing and recommending ICSAT and scaling out the efforts of both developing and disseminating these in an integrated manner. The book discusses, synthesizes, and offers alternative solutions to agriculture production systems and socio-economic development. It brings together biophysical and socioeconomic disciplines in evaluating suitable ICSAT in an effort to help reduce poverty and food insecurity. Highlights the research gaps and opportunities on climate smart agricultural technologies and institutional arrangements Provides information on institutional engagements that are inclusive of value chain actors that support partnerships and the development of interactive platforms Elaborates some of the effects of climate extremes on production and socioeconomic development on small farms whose impact has potentially large impact

This manual is specifically designed to help train actual and potential farm mechanization service providers, in order to increase access to sustainable farm power to raise the productivity of smallholder farmers. It focuses on two crucial aspects: the provision of farm mechanization services as a viable business opportunity for entrepreneurs, and the essential criteria of raising productivity in an environmentally sensitive and responsible way i.e. that includes conservation agriculture. Practical guidance on the essential business development and management skills required to successfully run a mechanization service provision business are presented, with a focus on the equipment required to offer services compatible with conservation agriculture. The manual will be of particular interest to policymakers' intent on



achieving sustainable intensification in the agricultural sector. It is also a valuable resource for trainers charged with increasing the supply of well-trained and well-equipped entrepreneurial mechanization service providers through the implementation of training courses tailored to the specific course locations.

The 'what' and 'why' of no-tillage farming. The benefits of no-tillage. The nature of risk in no-tillage. Seeding openers and slot shape. The role of slot cover. Drilling into dry soils. Drilling into wet soils. Seed depth, placement and metering. Fertilizer placement. Residue handling. Comparing surface disturbance and low-disturbance disc openers. No-tillage for forage production. No-tillage drill and planter design: large-scale machines. No-tillage drill and planter design: small-scale machines. Managing a no-tillage seeding system. Controlled-traffic farming as a complementary practice to no-tillage. Reduced environmental emissions and carbon sequestration. Some economic comparisons. Procedures for development and technology transfer.

Part I: low-external-input and sustainable agriculture (leisa): an emerging option; Agriculture and sustainability; Sustainability and farmers: making decisions at the farm level; Technology development by farmers; Part II: Principles and possibilities of leisa; Low-external-input farming and agroecology; Basic ecological principles of leisa; Development of leisa systems; Part III: Linking farmers and scientists in developing leisa technologies; Actors and activities in developing leisa technologies; Participatory technology development in practice: process and methods; Appendices; Appendix A some promising leisa techniques and practices; Appendix B glossary of key terms; Appendix C useful contacts and sources of further information; References; Index.

Tillage agriculture has led to widespread soil and ecosystem degradation globally. This is especially so in Africa where traditional and modern tillage-based agricultural practices have become unsustainable due to severe disturbance and exploitation of natural resources, with negative impacts on the environment and rural livelihoods. In addition, agriculture in Africa today faces major challenges including increased costs of production and energy, the effects of climate change, and the lack of an effective paradigm for sustainable intensification, especially for small- and medium-size holdings. Africa is facing a serious challenge to food security and as a continent has not advanced towards eradicating hunger. In addition, the population is still growing much faster than on most other continents. This pressure has led to the emergence of no-till conservation agriculture as a serious alternative sustainable agriculture paradigm. In Africa, in recent years, conservation agriculture techniques and methods have spread to many countries, as greater development, education and research effort are directed towards its extension and uptake. This book is aimed at agricultural researchers and scientists, educationalists, and agricultural service providers, institutional leaders and policy makers working in the fields of sustainable agriculture and international development, and also at agroecologists, conservation scientists, and those working on ecosystem services.

Continued population growth, rapidly changing consumption patterns and the impacts of climate change and environmental degradation are driving limited resources of food, energy, water and materials towards critical thresholds worldwide. These pressures are likely to be substantial across Africa, where countries will have to find innovative ways to boost crop and livestock production to avoid becoming more reliant on imports and food aid. Sustainable agricultural intensification - producing more output from the same area of land while reducing the negative environmental impacts - represents a solution for millions of African farmers. This

volume presents the lessons learned from 40 sustainable agricultural intensification programmes in 20 countries across Africa, commissioned as part of the UK Government's Foresight project. Through detailed case studies, the authors of each chapter examine how to develop productive and sustainable agricultural systems and how to scale up these systems to reach many more millions of people in the future. Themes covered include crop improvements, agroforestry and soil conservation, conservation agriculture, integrated pest management, horticulture, livestock and fodder crops, aquaculture, and novel policies and partnerships. This framework presents ten interrelated principles/elements to guide Sustainable Agricultural Mechanization in Africa (SAMA). Further, it presents the technical issues to be considered under SAMA and the options to be analysed at the country and sub regional levels. The ten key elements required in a framework for SAMA are as follows: The analysis in the framework calls for a specific approach, involving learning from other parts of the world where significant transformation of the agricultural mechanization sector has already occurred within a three-to-four decade time frame, and developing policies and programmes to realize Africa's aspirations of Zero Hunger by 2025. This approach entails the identification and prioritization of relevant and interrelated elements to help countries develop strategies and practical development plans that create synergies in line with their agricultural transformation plans. Given the unique characteristics of each country and the diverse needs of Africa due to the ecological heterogeneity and the wide range of farm sizes, the framework avoids being prescriptive.

Developing sustainable organic agriculture and resilient agribusiness sector is fundamental, keeping in mind the value of the opportunity presented by the growing demand for healthy and safe food globally, with the expectation for the global population to reach 9.8 billion by 2050, and 11 billion by 2100. Lately, the main threats in Europe, and worldwide, are the increasingly dynamic climate change and economic factors related to currency fluctuations. While the current environmental policy provides several mechanisms to support agribusinesses in mitigating organic food for daily increasing human population and stability of the currency, it does not contemplate the relative readiness of individuals and businesses to act correctly. Organic farming is the practice that relies more on using sustainable methods to cultivate crops and produce food animals, avoiding chemicals and dietary synthetic drug inputs that do not belong to the natural ecosystem. Organic agriculture can also contribute to meaningful socioeconomic, ecologically sustainable development, and significantly in the development of the agribusiness sector, especially in developing countries.

More than 500 million family farms manage the majority of the world's agricultural land and produce most of the world's food. We need family farms to ensure global food security, to care for and protect the natural environment and to end poverty, undernourishment and malnutrition. But these goals can be thoroughly achieved if public policies support family farms to become more productive and sustainable; in other words policies must support family farms to innovate within a system that recognizes their diversity and the complexity of the challenges faced. The State of Food and Agriculture 2014: Innovation in Family Farming analyses family farms and the role of innovation in ensuring global food security, poverty reduction and environmental sustainability. It argues that family farms must be supported to innovate in ways that promote sustainable intensification of production and improvements in rural livelihoods. Innovation is a process through which farmers improve their production and farm management practices. The 2014 edition of The State of Food and Agriculture, FAO's major flagship publication, considers innovations in family farms and their role in ensuring global food security, poverty reduction and environmental sustainability. Highlights: The world's food security and environmental sustainability depend on the more than 500 million family farms that form the backbone of agriculture in most countries. Family farms are an extremely diverse group, and innovation systems must take this diversity into account. Public investment in

agricultural R&D and extension and advisory services should be increased and refocused to emphasize sustainable intensification and close yield and labour productivity gaps. Capacity to innovate in family farming must be promoted at multiple levels. Individual innovation capacity must be developed through investment in education and training. Effective and inclusive producers' organizations can support innovation by their members.

Mr. Faulkner's masterpiece is recognized as the most important challenge to agricultural orthodoxy that has been advanced in this century. Its new philosophy of the soil, based on proven principles and completely opposed to age-old concepts, has had a strong impact upon theories of cultivation around the world. It was on July 5, 1943, when *Plowman's Folly* was first issued, that the author startled a lethargic public, long bemused by the apparently insoluble problem of soil depletion, by saying, simply, "The fact is that no one has ever advanced a scientific reason for plowing." With the key sentence, he opened a new era. For generations, our reasoning about the management of the soil has rested upon the use of the moldboard plow. Mr. Faulkner proved rather conclusively that soil impoverishment, erosion, decreasing crop yields, and many of the adverse effects following droughts or periods of excessive rainfall could be traced directly to the practice of plowing natural fertilizers deep into the soil. Through his own test-plot and field-scale experiments, in which he prepared the soil with a disk harrow, in emulation of nature's way on the forest floor and in the natural meadow, by incorporating green manures into its surface, he transformed ordinary, even inferior, soils into extremely productive, high-yield croplands. *Time* magazine called this concept "one of the most revolutionary ideas in agriculture history." The volume is being made available again not only because farmers, ranchers, gardeners, and agriculturists demanded it, but also because it details the kind of "revolution" which will aid those searching for the fruits of the earth in the emerging nations.

This paper is specifically about agricultural mechanisation: the opportunities provided by mechanisation for intensifying production in a sustainable manner, in value addition and agri-food value chain development, as well as the inherent opportunities implied for improved local economies and livelihoods. The establishment of viable business enterprises agro-processors, transport services, and so forth as a result of increased agricultural mechanisation in rural areas, is crucial to creating employment and income opportunities and, thereby, enhancing the demand for farm produce. Mechanisation plays a key role in enabling the growth of commercial agri-food systems and the efficiency of post-harvest handling, processing and marketing operations, and as such can be a major determinant in the availability and accessibility of food, the food prices paid by urban and rural poor, as well as contributing to increased household food security.

Agricultural Mechanization and Automation is a component of Encyclopedia of Food and Agricultural Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. The mechanization of farming practices throughout the world has revolutionized food production, enabling it to maintain pace with population growth except in some less-developed countries, most notably in Africa. Agricultural mechanization has involved the partial or full replacement of human energy and animal-powered equipment (e.g. plows, seeders and harvesters) by engine-driven equipment. The theme on Agricultural Mechanization and Automation cover six main topics: Technology and Power in Agriculture; Farm Machinery; Facilities and Equipment for Livestock Management; Environmental Monitoring; Recovery and Use of Wastes and by-Products; Slaughtering and Processing of Livestock, which are then expanded into multiple subtopics, each as a chapter. These two volumes are aimed at the following five major target audiences: University and College students Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs

Addressing a topic of major importance to the maintenance of world food supplies, this reference identifies knowledge gaps, defines priorities, and formulates recommendations for the improvement of the rice-wheat farming system. The book reveals new systems of rice intensification and management and illustrates the application of no-till and conser

"Conservation Agriculture (the use of no tillage systems) to preserve soil structure and integrity has become an increasingly important step towards sustainable farming. This book brings together conservation agriculture and climate smart decision making processes for the first time, focusing on Africa"--

Agricultural mechanization has often been characterized by scale-effects and increased specialization. Such characterizations, however, fail to explain how mechanization may grow in Africa where production environments are more heterogeneous and diversification of production may help in mitigating risks from increasingly uncertain climatic conditions. Using panel data from farm households and crop-specific production costs in Nigeria, we estimate how the adoption of animal traction or tractors affects the economies of scope (EOS) between rice, non-rice grains, legume/seed crops, and other crops, which are the crop groups that are most widely grown with animal traction or tractors in Nigeria. The results indicate that the adoption of these mechanization technologies is associated with lower EOS between non-rice grains, legume/seed crops, and other crops, but greater EOS between rice and other crops. An increase in EOS for rice is indicated in both primal and dual analytical approaches. Mechanical technologies may raise EOS between crops that are grown in more heterogeneous environments, even though it may lower EOS between crops that are grown in relatively similar environments. To the best of our knowledge, this is the first paper that shows the effects of mechanical technologies on EOS in agriculture in developing countries.

The dynamics of farm mechanization in pulses is a challenging issue to address. This text emphasizes the necessary keys in building and operating farm mechanization in pulses to complete the task by research, sensitization and policy decision. The authors believe that the book will help in implementation of farm mechanization in pulses which may be achieved with sensitization of farmers for adoption of recommendations, scientists to work on wide spectrum of researchable issues and policy makers to develop farmers friendly strong policy. The essence of the book will help in doubling the farmers income, reducing import of pulses and vanishing mal-nutrition from the country. The rice-wheat production system has major role in food security in the region and provides livelihood and income to millions of farmers in IGP. The lack of suitable mechanization and modernization with proper soil-crop management strategies is probably the cause of higher cost requirement and low return in the system. Current crop cultivation practices in rice-wheat systems degrade the soil and water resources thereby threaten the sustainability. The concept of alternative agricultural system is put forward to improve in net return with minimum resource use from crop cultivation is conservation agriculture (CA) the best alternative to protect soil, water, environment, time and cost. CA practices in Nepalese context have drastically reduced tillage intensity, reducing the cost of cultivation and allowing timely sowing with comparable yield.

The agricultural industry is dealing with enormous challenges across the globe,



including the limited availability of arable lands and fresh water, as well as the effect of climate change. Machinery plays a crucial role in agriculture and farming systems, in order to feed the world's growing population. In the last decade, we have witnessed major advances in agricultural machinery and technologies, particularly as manufacturers and researchers develop and apply various novel ways of automation as well as the data and information gathering and analyzing capabilities of their machinery. This book presents the state-of-the-art information on the important innovations in the agricultural and horticultural industry. It reviews and presents different novel technologies and implementation of these technologies to optimize farming processes and food production. There are four sections, each addressing a specific area of development. Section I discusses the recent development of farm machinery and technology. Section II focuses on water and irrigation engineering. Section III covers harvesting and post-harvest technology. Section IV describes computer modelling and simulation. Each section highlights current industry trends and latest research progress. This book is ideal for those working in or are associated with the fields of agriculture, agri-food chain and technology development and promotion.

Sustainability covers environmental, social and economic dimensions, and requires a multi-disciplinary approach in order to examine, explore and critically engage with issues and advances in its related areas. As we are aware, climate change is a certainty and it affects many economic sectors, including agriculture, particularly production of crop and livestock enterprises. Vast regional differences in these impacts are expected for various parts of the world, culminating in changes in trade patterns, and perhaps eventually even threatening the food security in certain parts of the world. Agricultural sustainability may be especially threatened by climate extremes, such as heat waves, droughts, and floods. However, not all changes induced by climate change would be negative; some may even be positive. Undoubtedly, there would be winners and losers within a nation, as well as among countries. Achieving sustainability would require changes in the way we manage agriculture. Equally important in this discourse is to find solutions to achieve sustainability in the wake of climate change, one of the major threats to sustainability. This book is devoted to various aspect of sustainable agriculture and climate change and their interplay.

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