

*Precision Agriculture For Sustainability And  
Environmental Protection Earthscan Food  
And Agriculture*

**According to Prof. D. Despommier, by the year 2050, nearly 80% of the earth's population will reside in urban centers. Furthermore, the human population will increase by about 3 billion people during the interim. New land will be needed to grow enough food to feed them. At**

**present, throughout the world, over 80% of the land that is suitable for raising crops is in use. What can be done to avoid this impending disaster? One possible solution is indoor farming. However, not all crops can easily be moved in an indoor environment. Nevertheless, to secure the food supply, it is necessary to increase the automation level in agriculture significantly. This book intends to provide the reader with a comprehensive**

**overview of the impact of the Fourth Industrial Revolution and automation examples in agriculture.**

**This book focuses on the recent advances in precision agriculture and satellite farming, detailing applications for sensing, data handling, modeling, and control. In addition, the book reviews its history - establishing the background on the various processes and applications - describes the current status, and offers insight into the future technology of**

**satellite farming in India. Introducing processes and applications based on a global scale, the book reveals how precision agriculture can be used in large-scale agriculture, community agriculture, and diversified farming. It includes site-specific information from a variety of information sources for planning, planting, growing, and harvesting agricultural crops. It also presents a new concept based on the control system theory that can be used to**

**formulate systematic methods for more effective precision crop production.**

**Precision agriculture when properly integrated into the crop production process, can greatly improve overall production and sustainability.**

**Agricultural production more than tripled between 1960 and 2015, owing in part to productivity-enhancing technologies and a significant expansion in the use of land, water, and other natural resources for agricultural**

**purposes. Today, more than ever, agriculture faces multiple and complex challenges. It has to provide sufficient, safe, and nutritious food to meet boosting demand by a growing and progressively more prosperous population, and ensure food security for all. Prepared to support the G20 Presidency of Japan and the G20 Agriculture Deputies, these three background notes provide an overview on the following interlinked issues: (i) the**

**policy challenges for strengthening the participation of farmers into modern value chains and promoting value addition, inclusion, sustainability and rural economic growth; (ii) the need for a transformation in the skillset of agricultural workers and a renewed focus on human capital development in agriculture, and (iii) the contribution of agriculture to the realization of the 2030 Agenda for Sustainable Development. In the last 20 years, there has been a**

**remarkable emergence of innovations and technological advances that are generating promising changes and opportunities for sustainable agriculture, yet at the same time the agricultural sector worldwide faces numerous daunting challenges. Not only is the agricultural sector expected to produce adequate food, fiber, and feed, and contribute to biofuels to meet the needs of a rising global population, it is expected to do so under increasingly**



**scarce natural resources and climate change. Growing awareness of the unintended impacts associated with some agricultural production practices has led to heightened societal expectations for improved environmental, community, labor, and animal welfare standards in agriculture. Toward Sustainable Agricultural Systems in the 21st Century assesses the scientific evidence for the strengths and weaknesses of different production, marketing, and policy**

**approaches for improving and reducing the costs and unintended consequences of agricultural production. It discusses the principles underlying farming systems and practices that could improve the sustainability. It also explores how those lessons learned could be applied to agriculture in different regional and international settings, with an emphasis on sub-Saharan Africa. By focusing on a systems approach to improving the sustainability of U.S. agriculture, this**

**book can have a profound impact on the development and implementation of sustainable farming systems. Toward Sustainable Agricultural Systems in the 21st Century serves as a valuable resource for policy makers, farmers, experts in food production and agribusiness, and federal regulatory agencies.**

**Examining International Land Use Policies, Changes, and Conflicts  
Automation and Precision Agronomics**

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# **for Sustainable Agricultural Systems Innovative Biosystems Engineering for Sustainable Agriculture, Forestry and Food Production**

## **Agriculture 5.0**

## **Securing Food Supplies for Future Generations**

## **Women in Precision Agriculture**

With the growing popularity and availability of precision equipment, farmers and producers have access to more data than ever before. With proper implementation, precision

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agriculture management can improve profitability and sustainability of production. Precision Agriculture Basics is geared at students, crop consultants, farmers, extension workers, and practitioners that are interested in practical applications of site-specific agricultural management. Using a multidisciplinary approach, readers are taught to make data-driven on-farm decisions using the most current knowledge and tools in crop science, agricultural engineering, and geostatistics. Precision Agriculture Basics also features a stunning video glossary including interviews with

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agronomists on the job and in the field.

Planetary sustainability hinges on transforming agriculture. Agriculture is both a fundamental driver of climate change as well as vulnerable to its adverse impacts. Furthermore, with increasing demands for agricultural production due to both global population increase and more affluent populations, its pressures on water quality, water availability and soil health are profound. To address these rising demands and pressures, climate smart agriculture and precision agriculture are touted as highly technical solutions with great merit in

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providing economic efficiencies as well as socio-environmental sustainability goals. With these promising technologies using high-resolution data, comes key challenges surrounding data privacy, access, and power. Further, transparent and open-source availability of farm-level data presents opportunities and challenges for policymakers to design incentive mechanisms that align with farmer needs to transition to more sustainable agricultural production. In the second article, precision agriculture (PA), a suite of technologies employing satellite imagery, machine learning, and big data, has

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been posited to enable sustainable transitions through precisely applying inputs and maximizing outputs. To address the future opportunities and challenges related to precision agriculture as a means of actualizing sustainable transitions, we use a pluralistic anticipatory governance framework. A mixed methods approach to analyze data from diverse stakeholder focus groups in South Dakota and Vermont including foresight methods, thematic analysis of discussions, and surveys to assess and anticipate governance of precision agriculture technologies in the present and



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future. Our findings show that these technologies offer powerful tools to assess the performance of sustainable practices and motivate farmers' decision-making toward sustainable transitions. Precision agriculture offers many possibilities for transitioning food production towards global sustainability goals, yet challenges associated with farm scale, data ownership, ethics of Artificial Intelligence technologies and lackluster response of regulatory agencies to understand the implications of PA emerged as important areas of research and societal concern. Farmers'

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motivation in operationalizing sustainable transitions is integral, the focus of the first article. Currently incentivized agricultural practices that sequester carbon, and reduce phosphorus and nitrogen runoff as well as increase farmer productivity through improved soil health are not widely adopted. Thus, the financial motivations offsetting risk and uncertainty may not be sufficiently aligned with farmer needs, leading to the governance challenge of incentive compatibility. In order to understand and improve the incentive structures for improving adoption of such practices, we

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investigate farmers' willingness to accept (WTA) payment for three practices: cover cropping, conservation tillage, and buffer strips. With three separate waves of data collected from farmers in Missisquoi and Lamoille watersheds in the Lake Champlain Basin, using the same survey instrument in 2013, 2015, and 2020, we estimate a Weighted Least Squares model to ascertain WTA using conjoint analysis. Our findings show that incentives were significant in 2015 with a higher magnitude of effect, while in 2020 incentives are weaker and not significant. The survey waves of 2015 and 202 suggest

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financial motivations offsetting risk and uncertainty may not be sufficiently aligned with farmer needs, leading to the governance challenge of incentive compatibility. Effective governance of sustainable transitions in agriculture is directly dependent on the incentive motivations as well as empirically verifiable performance criteria for reducing carbon, phosphorus and nitrogen emissions from the farms while maintaining or even increasing agricultural productivity. Precision agriculture provides novel methodologies in measuring and communicating carbon, phosphorus and nitrogen

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pollution as well as yield, with the potential to integrate these methodologies into performance-based incentive-compatible payment for ecosystem service mechanisms. Such technologies and policies are critical in enabling sustainability transitions in agriculture, yet established responsible and sustainable innovation frameworks are needed to ensure data privacy and equity in meeting the demands of farms of the future at all scales of production.

Sustainable agriculture is a key concept for scientists, researchers, and agricultural engineers alike. This book focuses on the

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FAM- project (FAM Munich Research Network on Agroecosystems) of the 1990s as a means to assessing, forecasting, and evaluating changes in the agroecosystems that are necessary for agricultural sustainability.

The management of two separate management systems: an organic and an integrated farming system are described to provide an interdisciplinary approach Changes of matter fluxes in soils, changes of trace gas fluxes from soils, precision farming in a small scale heterogen landscape, influence of management changes on flora and fauna, as well as the development of agroecosystem

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models, the assessment of soil variability and the changes in nutrient status are important aspects of this book. \* Contains detailed results and insight of a long-time project on agricultural sustainability \* Provides an interdisciplinary approach for comprehensive understanding by scientists and researchers of soil, plants, agriculture, and environment \* Includes an international perspective

Precision agriculture (PA) involves the application of technologies and agronomic principles to manage spatial and temporal variation associated with all aspects of

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agricultural production in order to improve crop performance and environmental quality. The focus of this book is to introduce a non-specialist audience to the the role of PA in food security, environmental protection, and sustainable use of natural resources, as well as its economic benefits. The technologies covered include yield monitors and remote sensing, and the key agronomic principles addressed are the optimal delivery of fertilizers, water and pesticides to crops only when and where these are required. As a result, it is shown that both food production and resource efficiency can be maximized,



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without waste or damage to the environment, such as can occur from excessive fertilizer or pesticide applications. The authors of necessity describe some technicalities about PA, but the overall aim is to introduce readers who are unfamiliar with PA to this very broad subject and to demonstrate the potential impact of PA on the environment and economy. The book shows how farmers can place sustainability of the environment at the centre of their operations and that this is improved with the application of PA. The range of topics described includes sampling and mapping, weed and pest control, proximal

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and remote sensing, spatio-temporal analysis for improving management, management zones and water management. These are illustrated with case studies on sampling and mapping, biofuels from sugar cane and maize, paddy rice cultivation, and cotton production.

Chapter 3 of this book is freely available as a downloadable Open Access PDF at <http://www.tandfebooks.com/page/openaccess> It has been made available under a Creative Commons Attribution-Non Commercial-No Derivatives 3.0 license.

Sustainability of Agricultural Environment in Egypt: Part I

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Toward Sustainable Agricultural Systems in  
the 21st Century

A Report to the G20 Agriculture Deputies July  
2019

Technological breakthroughs, Challenges and  
Aspirations for a Prosperous and Sustainable  
Future

Satellite Farming

Geostatistical Applications for Precision  
Agriculture

***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.*

*This book provides essential insights into methods and practices of 'Climate-smart Agriculture,' which is driven by the principles of climate resilience and smart resource use in agricultural production. Climate-smart agriculture is a key policy instrument for achieving poverty eradication and a hunger-free world, as well as mitigating the effects of climate*

*change. This book discusses in detail climate-smart agricultural technologies and practices that can reduce the vulnerability of agricultural systems, improve the livelihoods of farmers and other stakeholders, and reduce the greenhouse gas emissions from crop production and livestock husbandry. The agriculture, forestry and other land use (AFOLU) sector produces roughly 10-12 gigatons of CO<sub>2</sub>-equivalent per year; therefore, sustainable practices for agriculture and related land use hold*

*immense potential to mitigate climate change. The potential impacts of climate variability and climate change on agriculture are extensively documented and articulated, especially with regard to global and national environmental agendas that call for innovation, transformation and climate-resilient advances in agriculture. As the book demonstrates, climate-smart agriculture offers an excellent tool for boosting agricultural output to feed the growing global population; for reducing greenhouse gases*

*emissions from agriculture and other land use; and for protecting agricultural production systems from the impending dangers of climate change.*

*Faced with challenges of resource scarcity and environmental degradation, it is important to adopt innovative farming systems that maximize resource efficiency while protecting the environment. Soil-Specific Farming: Precision Agriculture focuses on principles and applications of soil-specific farming, providing information on rapidly evolving*



*agricultural technologies. It addresses assessments of soil variability and application of modern innovations to enhance use efficiency of fertilizers, irrigation, tillage, and pesticides through targeted management of soils and crops. This book provides the technological basis of adopting and promoting precision agriculture (PA) for addressing the issues of resource scarcity, environmental pollution, and climate change. It focuses specifically on PA technologies and discusses historical*

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*evolution, soil variability at different scales, soil fertility and nutrient management, water quality, land leveling techniques, and special ecosystems involving small landholders and coastal regions. Highlighting the scale-related issues and concerns of small landholders, the text details the efficient use of resources on the basis of soil/field variability and site-specific conditions. It examines how PA technology can increase productivity, enhance profitability, and minimize environmental degradation. Woven*

*throughout is the theme of sustainable use of resources.*

*The aim of this book is to bring together a series of contributions from experts in the field to cover the major aspects of the application of geostatistics in precision agriculture. The focus will not be on theory, although there is a need for some theory to set the methods in their appropriate context. The subject areas identified and the authors selected have applied the methods in a precision agriculture framework. The papers will*

*reflect the wide range of methods available and how they can be applied practically in the context of precision agriculture. This book is likely to have more impact as it becomes increasingly possible to obtain data cheaply and more farmers use onboard digital maps of soil and crops to manage their land. It might also stimulate more software development for geostatistics in PA.*

*Artificial Intelligence, IoT and Machine Learning*

*Background Notes on Sustainable,*

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*Productive and Resilient Agro-Food  
Systems: Value chains, human capital, and  
the 2030 Agenda*

*Field Crops: Sustainable Management by  
PGPR*

*Modeling for Sustainable Management in  
Agriculture, Food and the Environment*

*Agro-Environmental Sustainability in MENA  
Regions*

*Principles and Applications*

Precision agriculture integrates new technologies with the  
agronomic experience to intelligently manage the high

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spatial variability of all agricultural variables and the time scales at which these variables change. The right application of this approach increases the size and quality of the agricultural production; saves resources; improves environmental quality; helps to achieve self-sufficiency, food security, and agricultural sustainability; increases exports; and more. Precision Agriculture Technologies for Food Security and Sustainability is an essential reference source that compiles a comprehensive, multidisciplinary review of current research in the field of precision agriculture. It also discusses cutting-edge tools and models that can help facilitate and improve the systems

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implementation. Featuring coverage of a wide range of topics including agronomy, public policy, and internet of things, this book is ideally designed for agriculturalists, government officials, economists, environmentalists, academicians, researchers, students, and engineers in the fields of electronics, ICT, and agriculture.

This book discusses the most challenging task ahead of researchers from India and around the globe: providing disease-free field crops for the ever-growing world population. In Asia, despite being cultivated in massive volumes, major crops, including cereals, oil seed, tuber and non-tuber vegetables, and fruit, are not meeting the

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demands of the increasing population. This book showcases naturally occurring beneficial microbes in the form of plant growth promoting rhizobacteria, or PGPR, which make it possible to grow field crops without applying synthetic chemicals. Our understanding of PGPR has increased exponentially in recent decades. They play a multifarious role in developing sustainable systems of crop production and protection. The book focuses on the mechanistic behaviors of PGPRs, their use to develop sustainable cultivation techniques, and their application to enhance crop growth and productivity at the cutting edge of tech-oriented agriculture and to replace hazardous



chemicals with microbial inoculants. The book is useful to agronomists, microbiologists, ecologists, plant pathologists, molecular biologists, environmentalists, policy makers, conservationists, and NGOs working on organically grown field crops.

Smart Agrochemicals for Sustainable Agriculture proposes products that fulfill the need for chemicals that provide a sustainable delivery system for nutrients necessary to maximize production of agricultural animals and plants while producing the smallest possible environmental footprint. Over the past decade, biobased chemicals have received significant attention as candidate

resource materials in fertilizers and agrochemicals production due to their renewability. Substitution of conventional raw materials with biobased requires a new approach towards development of technology. On the other hand, the use of biobased chemicals, such as biostimulants, bioregulators, biofertilizers offers a host of a new palette of products which are natural and thus their application does not pose an impact on the environment (residues), nor the cultivated plants. This book addresses all aspects related to the production process, including chemical formulas, stability of formulations, and the application of the effect of its utilization. Presents ideas

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for new products that provide appropriate nutrition while limiting environmental footprint Includes full range of the production process from chemical formulas, to establishing the stability of formulations, application and effect Offers a host of a new products which are natural and whose application does not negatively impact the environment nor the cultivated plants

This book provides a review of precision agriculture technology development, followed by a presentation of the state-of-the-art and future requirements of precision agriculture technology. It presents different styles of precision agriculture technologies suitable for large scale

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mechanized farming; highly automated community-based mechanized production; and fully mechanized farming practices commonly seen in emerging economic regions. The book emphasizes the introduction of core technical features of sensing, data processing and interpretation technologies, crop modeling and production control theory, intelligent machinery and field robots for precision agriculture production.

Perspectives for Agroecosystem Management:

Precision Agriculture for Sustainability

Nanobiotechnology in Agriculture

A Better Planet

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An Approach Towards Sustainability

***Precision agriculture is a reality in agriculture and is playing a key role as the industry comes to terms with the environment, market forces, quality requirements, traceability, vehicle guidance and crop management. Research continues to be necessary, and needs to be reported and disseminated to a wide audience. These proceedings contain reviewed papers presented at the 12th European Conference***

***on Precision Agriculture, held at Montpellier SupAgro, France. The papers reflect the wide range of disciplines that impinge on precision agriculture - technology, crop science, soil science, agronomy, information technology, decision support, remote sensing and others. The broad range of research topics reported will be a valuable resource for researchers, advisors, teachers and professionals in agriculture long after the conference has finished.***

***Agriculture 5.0: Artificial Intelligence, IoT &***

***Machine Learning provides an interdisciplinary, integrative overview of latest development in the domain of smart farming. It shows how the traditional farming practices are being enhanced and modified by automation and introduction of modern scalable technological solutions that cut down on risks, enhance sustainability, and deliver predictive decisions to the grower, in order to make agriculture more productive. An elaborative approach has been used to highlight the applicability and adoption of key***

***technologies and techniques such WSN, IoT, AI and ML in agronomic activities ranging from collection of information, analysing and drawing meaningful insights from the information which is more accurate, timely and reliable. It synthesizes interdisciplinary theory, concepts, definitions, models and findings involved in complex global sustainability problem-solving, making it an essential guide and reference. It includes real-world examples and applications making the book accessible to a broader interdisciplinary***



***readership. This book clarifies how the birth of smart and intelligent agriculture is being nurtured and driven by the deployment of tiny sensors or AI/ML enabled UAV's or low powered Internet of Things setups for the sensing, monitoring, collection, processing and storing of the information over the cloud platforms. This book is ideal for researchers, academics, post-graduate students and practitioners of agricultural universities, who want to embrace new agricultural technologies for Determination of site-***

***specific crop requirements, future farming strategies related to controlling of chemical sprays, yield, price assessments with the help of AI/ML driven intelligent decision support systems and use of agri-robots for sowing and harvesting. The book will be covering and exploring the applications and some case studies of each technology, that have heavily made impact as grand successes. The main aim of the book is to give the readers immense insights into the impact and scope of WSN, IoT, AI and ML in the growth of***

***intelligent digital farming and Agriculture revolution 5.0. The book also focuses on feasibility of precision farming and the problems faced during adoption of precision farming techniques, its potential in India and various policy measures taken all over the world. The reader can find a description of different decision support tools like crop simulation models, their types, and application in PA. Features: Detailed description of the latest tools and technologies available for the Agriculture 5.0.***

***Elaborative information for different type of hardware, platforms and machine learning techniques for use in smart farming.***

***Elucidates various types of predictive modeling techniques available for intelligent and accurate agricultural decision making from real time collected information for site specific precision farming. Information about different type of regulations and policies made by all over the world for the motivation farmers and innovators to invest and adopt the AI and ML enabled tools and farming***

***systems for sustainable production.***

***In most developing countries, farming is the best safety net against hunger, and keeping production costs under control without sacrificing crop yield is essential for survival.***

***The Handbook of Precision Agriculture presents up-to-date research, field studies, and practical applications from around the world to help agricultural scientists and farmers work together to design a farming methodology that improves productivity, profitability, and sustainability. The book***

***offers a comprehensive guide to basic principles and technologies, crop-specific applications, integrative strategies, economic and environmental concerns, and future trends in precision agriculture in different regions of the world --***

***"Precision agriculture is based on the ability to identify inter and intra-field variability and to use this information for more targeted crop management. By using resources more efficiently, precision agriculture can make agriculture more productive and sustainable.***

***This volume reviews the key elements of and advances in precision agriculture technology and applications. Part 1 looks at monitoring techniques, including proximal soil and crop sensors and remote sensing technologies. The book then goes on to discuss how this information is processed to identify management zones and input targets as well as the delivery mechanisms required such as variable rate application and targeted spray technologies. The final part of the book surveys the wide range of applications of***

***precision agriculture, from controlled traffic farming to site-specific nutrient and water management. With its distinguished editor and international team of subject experts, this will be a standard reference for crop scientists and agronomists as well as all those concerned with improving the efficiency and sustainability of agriculture."--Provided by publisher.***

***Internet of Things A to Z  
Environment, Farmers Experiences,  
Innovations, Socio-economy, Policy***



## ***Forty Big Ideas for a Sustainable Future***

### ***Soil-Water-Food Nexus***

#### ***Soil-Specific Farming***

## ***Science Breakthroughs to Advance Food and Agricultural Research by 2030***

For nearly a century, scientific advances have fueled progress in U.S. agriculture to enable American producers to deliver safe and abundant food domestically and provide a trade surplus in bulk and high-value agricultural commodities and foods. Today, the U.S. food and agricultural enterprise faces formidable challenges that will test its long-term sustainability, competitiveness, and resilience. On its current path, future productivity in the U.S. agricultural system is likely to come with trade-offs. The success of agriculture is tied to

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natural systems, and these systems are showing signs of stress, even more so with the change in climate. More than a third of the food produced is unconsumed, an unacceptable loss of food and nutrients at a time of heightened global food demand. Increased food animal production to meet greater demand will generate more greenhouse gas emissions and excess animal waste. The U.S. food supply is generally secure, but is not immune to the costly and deadly shocks of continuing outbreaks of food-borne illness or to the constant threat of pests and pathogens to crops, livestock, and poultry. U.S. farmers and producers are at the front lines and will need more tools to manage the pressures they face. Science Breakthroughs to Advance Food and Agricultural Research by 2030 identifies innovative, emerging scientific advances for making the U.S. food and agricultural system more efficient, resilient, and sustainable.

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This report explores the availability of relatively new scientific developments across all disciplines that could accelerate progress toward these goals. It identifies the most promising scientific breakthroughs that could have the greatest positive impact on food and agriculture, and that are possible to achieve in the next decade (by 2030).

A thorough, critical, and up-to-date look at precision farming around the world In most developing countries, farming is the best safety net against hunger and keeping production costs under control without sacrificing crop yield is essential for survival. The Handbook of Precision Agriculture presents up-to-date research, field studies, and practical applications from around the world to help agricultural scientists and farmers work together to design a farming methodology that improves productivity, profitability, and

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sustainability. The book offers a comprehensive guide to basic principles and technologies, crop-specific applications, integrative strategies, economic and environmental concerns, and future trends in precision agriculture in different regions of the world. Handbook of Precision Agriculture provides basic guidelines and recommendations for implementing precision farming worldwide to help improve farm profits while conserving the environment. Keeping the technical jargon to a minimum, 50 of the world ' s foremost authorities on precision farming examine a wide range of subject areas, including agronomy, crop physiology, genetics and plant breeding, soil science, entomology, meteorology, agricultural extension, weed science, plant pathology, ecology, spatial information sciences, and economics. In addition to discussing theory and practice on field-level management, the book ' s

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contributors discuss how to identify and manage field variability, and how to implement precision farming in selected crops and cropping systems, working from case studies that represent both regional and crop-specific contexts. Topics examined in Handbook of Precision Agriculture include: essential technologies for precision farming site-specific nutrient management precision water management site-specific weed management precision management of rice site-specific management of cotton producing precision farming from a cropping systems perspective case studies of precision farming in Europe, Australia, and South America and much more Handbook of Precision Agriculture also includes a foreword written by the renowned agricultural scientist, administrator, and World Food Prize Laureate, Professor M.S. Swaminathan. Peer-reviewed by more than 100 reviewers from

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around the world, this unique book presents detailed information and concepts in a simple and direct style that 's easy to understand-even for beginners!

Agriculture is considered as a backbone of developing nations as it caters the needs of the people, directly or indirectly. The global agriculture currently faces enormous challenges like land degradation and reduced soil fertility, shrinking of land, low production yield, water accessibility and a dearth of labor due to evacuation of individuals from farming. Besides, the global population increases at an exponential rate and it is predicted that the global population will be 9 billion by 2050 that in turn leads to food crisis in near future. Although, green revolution revolutionizes the agriculture sector by enhancing the yield but it was not considered as a sustainable approach. Exorbitant use of chemical

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fertilizers and pesticides to boost the crop yield is definitely not a convenient approach for agriculture sustainability in the light of the fact that these chemical fertilizers are considered as double-edged sword, which on one hand enhance the crop yield but at the same time possess deleterious effect on the soil microflora and thus declines its fertility. Besides, it cause irreversible damage to the soil texture and disrupts the equilibrium in the food chain across ecosystem, which might in turn lead to genetic mutations in future generations of consumers. Thus, the increased dependence on fabricated agricultural additives during and post green revolution has generated serious issues pertaining to sustainability, environmental impact and health hazards. Therefore, nano-biotechnology has emerged as a promising tool to tackle the above problems especially in the agriculture sector. Nano-agribusiness is

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an emerged field to enhance crop yield, rejuvenate soil health, provide precision farming and stimulate plant growth. Nano-biotechnology is an essential tool in modern agriculture and is considered as a primary economic driver in near future. It is evaluated that joining of cutting edge nanotechnology in agribusiness would push the worldwide monetary development to approximately US\$ 3.4 trillion by 2020 which clearly indicates that how agri-nanobiotechnology plays a pivotal role in the agricultural sector, without any negative impact on the environment and other regulatory issues of biosafety. Agri-nanobiotechnology is an innovative green technology, which provides the solution to global food security, sustainability and climate change. The current book is presenting the role of nano-biotechnology in modern agriculture and how it plays a pivotal role to boost the agri-business.



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AI, Edge, and IoT Smart Agriculture integrates applications of IoT, edge computing, and data analytics for sustainable agricultural development and introduces Edge of Thing-based data analytics and IoT for predictability of crop, soil, and plant disease occurrence for improved sustainability and increased profitability. The book also addresses precision irrigation, precision horticulture, greenhouse IoT, livestock monitoring, IoT ecosystem for agriculture, mobile robot for precision agriculture, energy monitoring, storage management, and smart farming. The book provides an overarching focus on sustainable environment and sustainable economic development through smart and e-agriculture. Providing a medium for the exchange of expertise and inspiration, contributions from both smart agriculture and data mining researchers around the world provide foundational insights. The

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book provides practical application opportunities for the resolution of real-world problems, including contributions from the data mining, data analytics, Edge of Things, and cloud research communities working in the farming production sector. The book offers broad coverage of the concepts, themes, and instruments of this important and evolving area of IOT-based agriculture, Edge of Things and cloud-based farming, Greenhouse IOT, mobile agriculture, sustainable agriculture, and big data analytics in agriculture toward smart farming. Integrates sustainable agriculture, Greenhouse IOT, precision agriculture, crops monitoring, crops controlling to prediction, livestock monitoring, and farm management Presents data mining techniques for precision agriculture, including weather prediction, plant disease prediction, and decision support for crop and soil selection Promotes the

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importance and uses in managing the agro ecosystem for food security Emphasizes low energy usage options for low cost and environmental sustainability

AI, Edge and IoT-based Smart Agriculture

Earth Observation Open Science and Innovation

Nano-enabled Sustainable and Precision Agriculture

Automation in Agriculture

Precision Agriculture for Sustainability and Environmental Protection

Precision Agriculture Technology for Crop Farming

A practical, bipartisan call to action from the world's leading thinkers on the environment and sustainability Sustainability has emerged as a global priority over the

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past several years. The 2015 Paris Agreement on climate change and the adoption of the seventeen Sustainable Development Goals through the United Nations have highlighted the need to address critical challenges such as the buildup of greenhouse gases in the atmosphere, water shortages, and air pollution. But in the United States, partisan divides, regional disputes, and deep disagreements over core principles have made it nearly impossible to chart a course toward a sustainable future. This timely new book, edited by celebrated scholar Daniel C. Esty, offers fresh thinking and forward-looking

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solutions from environmental thought leaders across the political spectrum. The book's forty essays cover such subjects as ecology, environmental justice, Big Data, public health, and climate change, all with an emphasis on sustainability. The book focuses on moving toward sustainability through actionable, bipartisan approaches based on rigorous analytical research.

As the public and producers becomes more aware of the environmental and economic benefits of precision farming, there has been increased demand for quality training to accurately evaluate spatial variability

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within fields. Practical Mathematics in Precision Farming provides hand-on training and examples for certified crop consultants (CCAs), farmers, crop consultants, and students (both undergraduate and graduate) on how to conduct to conduct and analyze on-farm studies, write simple programs, use precision techniques to scout for pests and collect soil samples, develop management zones, determine the cost of production, assess the environmental consequences of precision techniques, understand soil test results, and develop site-specific nutrient and plant population algorithms. Using real agronomic

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examples, the reader is taught the crucial task of managing products and inputs for application at the right rate, place, and time.

A comprehensive overview of the Internet of Things' core concepts, technologies, and applications Internet of Things A to Z offers a holistic approach to the Internet of Things (IoT) model. The Internet of Things refers to uniquely identifiable objects and their virtual representations in an Internet-like structure. Recently, there has been a rapid growth in research on IoT communications and networks, that confirms the scalability and

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broad reach of the core concepts. With contributions from a panel of international experts, the text offers insight into the ideas, technologies, and applications of this subject. The authors discuss recent developments in the field and the most current and emerging trends in IoT. In addition, the text is filled with examples of innovative applications and real-world case studies. Internet of Things A to Z fills the need for an up-to-date volume on the topic. This important book: Covers in great detail the core concepts, enabling technologies, and implications of the Internet of Things



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Addresses the business, social, and legal aspects of the Internet of Things Explores the critical topic of security and privacy challenges for both individuals and organizations Includes a discussion of advanced topics such as the need for standards and interoperability Contains contributions from an international group of experts in academia, industry, and research Written for ICT researchers, industry professionals, and lifetime IT learners as well as academics and students, Internet of Things A to Z provides a much-needed and comprehensive resource to this burgeoning

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field.

This book focuses on the status quo and the latest information on the water-soil-agriculture nexus in the MENA countries. It presents several case studies and applications from e.g. Morocco, Algeria, Tunisia, Egypt and Jordan, while also sharing and discussing the latest findings. The content includes a range of agriculture-related topics that focus on: water resources management, impacts of climate change, and wastewater treatment for reuse in agriculture sectors; in addition, sustainable approaches to agricultural-based industry, organic crop

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production, crop water requirements, and soil environment are discussed in an updated and comprehensive review. In turn, the book discusses the applications of GIS and remote sensing as a new technology for better agriculture management, as well as its use in Egypt as a representative country. In closing, it considers the implementation of an environmental information system in data-scarce MENA countries from the standpoint of the water-food nexus, and addresses the question of climate justice in the MENA region. Exploring various dimensions of MENA country-based case studies on achieving

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sustainable agriculture, the book offers an invaluable source of topical information for agricultural sustainability-related stakeholders in the region, researchers and graduate students alike.

International Mid-Term Conference 2019 of the Italian Association of Agricultural Engineering (AIIA)

Conservation Agriculture

Sustainability Transitions With Precision Agriculture and Compatible Incentives for Farmers

Practical Mathematics for Precision Farming

Precision Agriculture: Technology and

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Economic Perspectives

Bioproduction Engineering

*This volume discusses the sustainability of Egypt's agriculture and the challenges involved. It provides a comprehensive review and the latest research findings, and covers a variety of topics under the following themes:*

- Applicability of sustainable agriculture in Egypt*
- Sustainable agriculture under water scarcity and polluted soil environments*
- Improved crop productivity using a variety of tried and tested procedures*
- Biotechnology application for agricultural sustainability and food security*
- Potentiality of soil-sensing for a more sustainable agricultural*

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*environment The volume closes with a summary of the key conclusions and recommendations from all chapters. Together with the companion volume Sustainability of Agricultural Environment in Egypt: Part II, it offers an essential source of information for postgraduate students, researchers, and stakeholders alike.*

*Recent developments in computer science, data mining and big data analytics have resulted in new operational frameworks in agriculture, food and the environment, which in fact, share a strong link between them. A key challenge for researchers is to extract new data patterns and utilize them in decision making.*

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*Managers, policy makers, and practitioners have to be aware of these methodologies in order to establish efficient and effective working groups for the tasks to be resolved. The book reviews the complexity of the interrelationship between agriculture, food production and processing, and environmental issues. It also highlights the prospects of modeling in various cases of problem solving in these sectors, and reviews the new and future challenges. Consumer awareness in food production and processing practices is continually increasing and the necessity for advanced behavioural tools follows the same trend. Furthermore, the value chain management challenge is becoming one of the*

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*most crucial tasks due to the increased importance of new parameters like the origin of products, its environmental footprint and the enhancement of local production, etc. The book addresses these topics in a holistic approach, merging modeling with advanced marketing practices in a coherent and innovative manner, being an effective tool in a continuously demanding world.*

*Crop production varies spatially and temporally within the field boundaries depending on soil and environmental conditions. The major concern of variability for agronomic inputs addresses how best to intervene in the right place, at the right time and in the*



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*right quantity to improve the potential yield of crops and feedstock. This book addresses the important question of how large a role bioproduction and renewable energy can play in achieving sustainable agricultural practices in the present system of agricultural production. Agronomy is local, which brings the challenges to the remote optimisation of agricultural machinery operations for seeding, fertilising, crop protecting, and harvesting in the field level to adopt precise agriculture technologies. Cloud computing and big data analytics bring the potential about in machine optimisation and agronomy to enable the site-specific management. Understanding*

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*bioproduction engineering and development can help improve the efficiency of a sustainable agriculture system. With the aim of understanding this process, this book focuses on bioproduction and sustainability issues, covering sensors, agricultural decision-making systems and the relationship between bioproduction and sustainable practices of agriculture. The chapters are organised as follows: information oriented technology that can be implemented to address the variability of bioproduction systems, sensors and control systems, precision agricultural technology, decision support systems in agriculture, renewable energy resources and analytical hierarchy processes*

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*for agricultural management. The crop growth monitoring parameters like LAI and NDVI points were clarified in the pre-processing stage of images. The decisions and logistics that influence the market prices of agricultural products is emphasised within the revised edition of this book.*

*This book is published open access under a CC BY 4.0 license. Over the past decades, rapid developments in digital and sensing technologies, such as the Cloud, Web and Internet of Things, have dramatically changed the way we live and work. The digital transformation is revolutionizing our ability to monitor our planet and transforming the way we access, process and exploit*

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*Earth Observation data from satellites. This book reviews these megatrends and their implications for the Earth Observation community as well as the wider data economy. It provides insight into new paradigms of Open Science and Innovation applied to space data, which are characterized by openness, access to large volume of complex data, wide availability of new community tools, new techniques for big data analytics such as Artificial Intelligence, unprecedented level of computing power, and new types of collaboration among researchers, innovators, entrepreneurs and citizen scientists. In addition, this book aims to provide readers with some reflections on the future of Earth*

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*Observation, highlighting through a series of use cases not just the new opportunities created by the New Space revolution, but also the new challenges that must be addressed in order to make the most of the large volume of complex and diverse data delivered by the new generation of satellites.*

*Precision Agriculture Basics*

*Global Climate Change: Resilient and Smart Agriculture Balancing Environmental and Socio-economic Demands*

*Precision Agriculture*

*Handbook of Precision Agriculture*

*Sensing Approaches for Precision Agriculture*

**Though conflicts continue to arise over**

land use and land cover changes, the conversion of forest land to cropland or other land uses such as housing and urban development have been on the rise in recent years. Decisions regarding land use and land cover influence climate change as well as various natural processes. While proper changes can minimize the effects and speed of climatic changes, the continued adverse changes may be accelerating the deterioration of the world's condition. Examining International Land Use Policies, Changes, and Conflicts

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presents the latest research on the present status of land use and land cover changes throughout the world in order to determine appropriate land use policies that can protect earth's present and future condition. The findings of the studies investigate the conflicts behind the land tenure and land uses in different countries of the world and examines existing policies and the reasons behind changes in them. Ultimately, the book provides readers with knowledge on how land can be managed in a sustained manner,

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how landscape models are helpful for predicting and determining future land uses, how land can be managed with the best architectural measures, and how urban forestry is helpful for better environmental management and adapting or mitigating climate change effects. Land users, agriculturalists, urban planners, policymakers, government officials, researchers, academicians, and students looking to improve their understanding of this topic for better use of land in the future will find this book to be an asset



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to their current research.

Precision Agriculture for Sustainability  
and Environmental Protection Routledge

Nano-enabled Sustainable and Precision  
Agriculture is the first single-volume

resource to cover this important field  
using a whole systems approach that

considers both opportunities and  
challenges. The book provides a

comprehensive understanding of the role of  
nanotechnology in agriculture from broad

aspects, but also includes a comprehensive  
view of the interaction of nanomaterials

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with soil-plant systems. It highlights aspects not described in previous books, including the application of nanoinformatics and artificial intelligence in nano-enabled sustainable agriculture, the application of nanotechnology in alternative forms of agriculture such as hydroponics, and regulatory frameworks for this research field. The book addresses all these aspects by including sections on enhanced sustainability, reduced pollution and enhanced ecosystems' health, and the role

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of nanoinformatics and machine learning.  
Provides foundational insights and  
resources for each area, including soil  
science, water chemistry, nanoscience,  
plant science, microbiology and  
nanoinformatics Focuses on mechanisms of  
action, transformations and the  
underpinning chemistry and biochemistry  
Includes linkages and cross-referencing  
between chapters to ensure a cohesive and  
comprehensive resource  
Sensing Approaches for Precision  
Agriculture aims to bring together the

'state of the art' of the most popular sensing techniques and the current state of research on the application of sensors in Precision Agriculture (PA). Sensing is of great value in PA because it provides cheap and immediate data for management. This book gives a broad overview of sensing in PA and a coherent introduction for new professionals and research scientists. Readers are introduced to the potential applications of a range of different sensors, how they should be used properly and their limitations for use in

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PA. Chapters on specific topics and case studies provide depth and enable implementation of the methods by users. A general introduction about sensing techniques in PA is followed by Chapters 2-9 on the most important specific techniques in sensing and Chapters 10-13 include mini-case studies, each showing cutting-edge applications for different sensing methods. Finally, there is an Epilogue on how we expect sensors and analysis to develop.

Precision agriculture '19

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**Technologies and Applications**

**Smart Agrochemicals for Sustainable  
Agriculture**

**Precision Agriculture Technologies for  
Food Security and Sustainability**

**An Information and Technology Based  
Agriculture**

This book gathers the latest advances, innovations, and applications in the field of innovative biosystems engineering for sustainable agriculture, forestry and food production. Focusing on the challenges of implementing sustainability in various contexts in the fields of biosystems engineering, it shows how the research has addressed the

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sustainable use of renewable and non-renewable resources. It also presents possible solutions to help achieve sustainable production. The Mid-Term Conference of the Italian Association of Agricultural Engineering (AIIA) is part of a series of conferences, seminars and meetings that the AIIA organizes, together with other public and private stakeholders, to promote the creation and dissemination of new knowledge in the sector. The contributions included in the book were selected by means of a rigorous peer-review process, and offer an extensive and multidisciplinary overview of interesting solutions in the field of innovative biosystems engineering for sustainable agriculture. This book features influential scholarly research and technical contributions, professional trajectories,

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disciplinary shifts, personal insights, and a combination of these from a group of remarkable women scholars within precision agriculture. The authors provide a holistic and critical overview of the field of precision agriculture (both crop and livestock), highlighting breakthroughs and impactful research led by women investigators including relevant technologies, decision making strategies, practices, applications, economics, opportunities and challenges. They discuss the urgent need for reduced cost, increased productivity, more optimal use of resources, and reduced impact on our environment. The leading female researchers contributing to this book are creating new technological advances that are revolutionizing agriculture. Focuses on advances in precision agriculture led by leading



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women researchers, scholars, and professionals; Provides insight into women's technical contributions in precision agriculture; Takes a holistic approach to precision agriculture, addressing both land and livestock applications. This book presents cases from different countries with a main focus on the perspectives of using precision farming in Europe. Divided into 12 chapters it addresses some of the most recent developments and aspects of precision farming. The intention of this book is to provide an overview of some of the most promising technologies with precision agriculture from an economic point of view. Each chapter has been put together so that it can be read individually should the reader wish to focus on one particular topic. Precision Farming as a farm technology benefits from large-

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scale advantages due to relatively high investment costs and is primarily adopted on farms with medium to large field areas.