

worldwide, and (2) the use of space data in hydrological modeling either through data assimilation or as external constraints. The water resources aspect is also addressed, as well as the impacts of direct anthropogenic forcing on land hydrology (e.g. ground water depletion, dam building on rivers, crop irrigation, changes in land use and agricultural practices, etc.). Remote sensing observations offer important new information on this important topic as well, which is highly useful for achieving water management objectives. Over the past 15 years, remote sensing techniques have increasingly demonstrated their capability to monitor components of the water balance of large river basins on time scales ranging from months to decades: satellite altimetry routinely monitors water level changes in large rivers, lakes and floodplains. When combined with satellite imagery, this technique can also measure surface water volume variations. Passive and active microwave sensors offer important information on soil moisture (e.g. the SMOS mission) as well as wetlands and snowpack. The GRACE space gravity mission offers, for the first time, the possibility of directly measuring spatio-temporal variations in the total vertically integrated terrestrial water storage. When combined with other space observations (e.g. from satellite altimetry and SMOS) or model estimates of surface waters and soil moisture, space gravity data can effectively measure groundwater storage variations. New satellite missions, planned for the coming years, will complement the constellation of satellites monitoring waters on land. This is particularly the case for the SWOT mission, which is expected to revolutionize land surface hydrology. Previously published in *Surveys in Geophysics*, Volume 37, No. 2, 2016

This report first provides an outlook for the agricultural and food market and highlights the challenges that population trends, rising global incomes and climate change present to agriculture and water. The following section focuses on two broad areas that require attention and presents recommendations on: (i) policies within the agricultural domain that apply specifically to the sector, such as water supply enhancement, water loss reduction, crop productivity, water re-allocation, and options for rainfed agriculture; and (ii) actions within the water domain that relate to water management for all sectors, not only agriculture.

This book, which contains 14 chapters, covers all aspects of rainfed agriculture, starting with its potential, current status, rainwater harvesting and supplementary irrigation, to policies, approaches, institutions for upscaling, and impacts of integrated water management programmes in rainfed areas.

With headlines focused on human suffering - civil wars, refugee flows, the spread of disease due to hunger and poor sanitation, population growth, climate change - it is easy to dive into despair. What is needed, instead, is a radical rethinking of global policy to realize the potential for improving the human condition. This book help provides hope by examining the basic needs for a fundamental shift in thinking about development and human security for both practical and ethical reasons. Kenneth A. Reinert calls for a basic goods approach that focuses on the provision of nutritious food, clean water, sanitation, health services, education services, housing, electricity, and human security services. This approach bridges two perspectives: that of standard growth, which emphasizes increasing GDP per capita, and that of capabilities/human development, which puts priority on the realization of human potential. Reinert argues that only when growth leads to an increase in the broad-based provision of basic goods and services will the hoped-for expansion of human capabilities and development be achieved. In short, basic goods and services are a critical link between growth and human development. *No Small Hope: Towards the Universal Provision of Basic Goods* places the basic goods approach on the firm foundation of objective human needs and subsistence rights. It offers a practical agenda for making real progress towards human development by focusing on the real determinants of human well-being in an ethical system of moral minimalism. In a world of climate change, increased risk of natural disasters and increased refugee flows, the basic goods approach promises to help alleviate ongoing suffering and address vast deprivations in basic needs fulfillment.

This publication considers what is involved in ensuring that biodiversity contributes to improved food security. It summarizes the major challenges expected over the next 40 years and offers a perspective on the fundamental changes needed to ensure that biodiversity contributes to sustainable and productive systems.

Fossil independence and substantial reductions in CO₂ emissions seem to be possible with 2nd generation biofuels. New technologies allow a full carbon-to-fuel conversion of non-edible plant parts such as straw or wood, and the cultivation of algae or salt-resistant plants uncouples bioenergy from food production. Nevertheless, impacts on biodiversity, global land and water use are widely unclear and their competitiveness with 1st generation biofuels and electric mobility is an open question. An interdisciplinary team of Empa, University of Zurich and the Institute of Climate, Environment and Energy in Wuppertal evaluated the most sustainable production techniques and assessed their potential for our future mobility. Zielpublikum: Energie- und Umweltfachleute, Entwicklungsingenieure, Klima-/Energiebeauftragte, Behörden/Politiker

The Global Food Policy Report is IFPRI's flagship publication. This year's annual report examines major food policy issues, global and regional developments, and commitments made in 2015, and presents data on key food policy indicators. The report also proposes key policy options for 2016 and beyond to achieve the Sustainable Development Goals. In 2015, the global community made major commitments on sustainable development and climate change. The global food system lies at the heart of these commitments—and we will only be able to meet the new goals if we work to transform our food system to be more inclusive, climate-smart, sustainable, efficient, nutrition- and health-driven, and business-friendly.

This book represents an interdisciplinary approach to the relevant aspects of agricultural production related to the interactions between natural processes, human activities and the environment. It provides condensed and comprehensive knowledge on the functions of various agroecosystems at the field, landscape and global scale. Understanding and integrating complex ecological processes into field production, land management and food systems is essential in order to deal with the challenges of modern crop and livestock production: the need for food security for the growing human population, and the necessity to combat the detrimental effects of food production on the environment. The book

presented. Agricultural implications of sea level rise, as a subsequent impact of climate change, are also examined.

World Agriculture Towards 2030/2050 The 2012 Revision 2020-2029 OECD Publishing

The report assesses the World Bank Group's support for growth and productivity in the agriculture sector. Enhancing agricultural growth and productivity is essential to meeting the worldwide demand for food and to reducing poverty, particularly in the poorest developing countries. Between 1998 and 2008, the period covered by this evaluation, the World Bank Group (WBG) provided \$23.7 billion in financing for agriculture and agribusiness in 108 countries (roughly 8 percent of total WBG financing), spanning areas from irrigation and marketing to research and extension. However, this was a time of declining focus on agricultural growth and productivity by both countries and donors. The cost of inadequate attention to agriculture, especially in agriculture-based economies, came into focus with the food crisis of 2007-08. The crisis added momentum to an emerging renewal of attention and stepped-up financing to agriculture and agribusiness at the World Bank and International Finance Corporation (IFC), as well as at several multilateral and bilateral agencies. World Bank financing rose two and a half times from 2008 to 2009, though that increase in lending seems to have been accompanied by a decline in analytical work, which this review finds valuable for results. This evaluation seeks to provide lessons from successes and failures to help improve the development impact of the renewed attention to the sector. Ratings against the World Bank's stated objectives and IFC's market-based benchmarks for agriculture and agribusiness projects have been equal to or above portfolio averages in East Asia, Latin America, and the transition economies in Europe, with notable successes over a long period in China and India. But performance of WBG interventions has been well below average in Sub-Saharan Africa, where IFC has had little engagement in agribusiness. Inconsistent client commitment and weak capacity have limited the effectiveness of WBG support in agriculture-based economies, particularly in Sub-Saharan Africa, and constraints on staffing and internal coordination within the WBG have also hurt outcomes. Financial sustainability has been constrained by insufficient government funding and the difficulty of maintaining agricultural services and infrastructure. The WBG has a unique opportunity to match the increases in the financing for agriculture with sharper focus on improving agricultural growth and productivity in agriculture-based economies, notably in Sub-Saharan Africa. Greater effort will be needed to connect sectoral interventions and achieve synergies from public and private sector interventions; to build capacity and knowledge exchange; to take stock of experience in rain-fed agriculture; to ensure attention to financial sustainability and to cross-cutting issues of gender, environmental and social impacts, and climate; and to better integrate WBG support at the global and regional levels with that at the country level.

Going beyond an individualized perspective, he poses audacious questions: What does it mean that patients are poor or uninsured and cannot afford suggested medicines? How can we deal with the air and water pollution that are producing a patient's illness? How do we respond to patients complaining about the safety and quality of drinking water in their neighborhood? Touching on infectious and noncommunicable diseases, as well as food, medicine, and water, *Wounded Planet* transcends the limited vision of mainstream bioethics to compassionately reveal how healthcare and medicine must take a broad perspective that includes the social and environmental conditions in which individuals live.

How can we achieve FAO's original vision of a world free from hunger and malnutrition? The report sheds some light on the nature of the challenges that agriculture and food systems are facing now and throughout the 21st century, and provides some insights as to what is at stake and what needs to be done. What emerges is that "business as usual" is no longer an option but calls for major transformations in agricultural systems, in rural economies and in how we manage our natural resources. The report was undertaken for the quadrennial review of the FAO Strategic Framework and in preparation for the Organization's Medium-Term Plan 2018-2021.

Taking a comparative and multidisciplinary approach, this textbook offers a non-technical introduction to the dynamics of socio-economic development and stagnation.

By 2050 the world will be faced with the enormous challenge of feeding 9 billion people despite being affected by climate change, rising energy costs and pressure on food growing land and other major resources. How will the world produce 70% more food by 2050 to feed a projected extra 2.3 billion people? What will be the impact of food shortages and high prices on areas in crisis such as sub-Saharan Africa? Where will future production growth come from? And how do we balance the need for environmental protection with sustainable agricultural production methods? This is the first text to present a scholarly, balanced approach to the contentious area of food production and supply up to 2050 - offering a readable and well-informed account which tackles the global food situation in all its totality, from agricultural production, technological advance, dietary concerns, population changes, income trends, environmental issues, government food and agriculture policy, trade, financial markets, macroeconomics and food security. Highly accessible and written by a specialist author with experience as an agricultural analyst, policy advisor and researcher, *Global Food Futures* synthesises the key issues in one volume. Estimating future demand for food is a critical aspect of global food security analyses. The process linking dietary changes to wealth is known as the nutrition transition and presents well-identified features that help to predict consumption changes in poor countries. This study proposes to represent the nutrition transition with a nonhomothetic, flexible-in-income, demand system, known as the Modified Implicitly Directly Additive Demand System (MAIDADS). The resulting model is transparent and estimated statistically based on cross-sectional information from FAOSTAT the statistical database of the Food and Agriculture Organization of the United Nations. It captures the main features of the nutrition transition: rise in demand for calories associated with income growth; diversification of diets away from starchy staples; and a large increase in caloric demand for animal-based products, fats, and sweeteners. The estimated model is used to project food demand between 2010 and 2050 based on a set of plausible futures (trend projections and Shared Socioeconomic Pathways scenarios). The main results of these projections are as follows: (1) global food demand will increase by 46 percent, less than half the growth in the previous four decades; (2) this growth will be attributable mainly to lower-middle-income and low-income countries; (3) the structure of global food demand will change over the period, with a 95 percent increase in demand for animal-based calories and a much smaller 18 percent increase in demand for starchy staples; and (4) the analysis of a range of population and income projections reveals important uncertainties depending on the scenario, the projected increases in demand for animal-based and vegetal-based calories range from 78 to 109 percent and from 20 to 42 percent, respectively.

As technology continues to saturate modern society, agriculture has started to adopt digital computing and data-driven innovations. This emergence of "smart" farming has led to various advancements in the field, including autonomous equipment and the collection of climate, livestock, and plant data. As connectivity and data management continue to revolutionize the farming industry, empirical research is a necessity for understanding these technological developments. *Artificial Intelligence and IoT-Based Technologies for Sustainable Farming and Smart Agriculture* provides emerging research exploring the theoretical and practical aspects of critical technological solutions within the farming industry. Featuring coverage on a broad range of topics such as crop monitoring, precision livestock farming, and agronomic data processing, this book is ideally designed for farmers, agriculturalists, product managers, farm holders, manufacturers, equipment suppliers, industrialists, governmental professionals, researchers, academicians, and students seeking current research on technological applications within agriculture and farming.

Hunger is a daily reality for a billion people. More than six decades after the technological discoveries that led to the Green Revolution aimed at ending world hunger, regular food shortages, malnutrition, and poverty still plague vast swaths of the world. And with increasing food prices, climate change, resource inequality, and an ever-increasing global population, the future holds further challenges. In *One Billion Hungry*, Sir Gordon Conway, one of the world's foremost experts on global food needs, explains the many interrelated issues critical to our global food supply from the science of agricultural advances to the

politics of food security. He expands the discussion begun in his influential *The Doubly Green Revolution: Food for All in the Twenty-First Century*, emphasizing the essential combination of increased food production, environmental stability, and poverty reduction necessary to end endemic hunger on our planet. Beginning with a definition of hunger and how it is calculated, and moving through issues topically both detailed and comprehensive, each chapter focuses on specific challenges and solutions, ranging in scope from the farmer's daily life to the global movement of food, money, and ideas. Drawing on the latest scientific research and the results of projects around the world, Conway addresses the concepts and realities of our global food needs: the legacy of the Green Revolution; the impact of market forces on food availability; the promise and perils of genetically modified foods; agricultural innovation in regard to crops, livestock, pest control, soil, and water; and the need to both adapt to and slow the rate of climate change. *One Billion Hungry* will be welcomed by all readers seeking a multifaceted understanding of our global food supply, food security, international agricultural development, and sustainability. A unique book which reflects the multifaceted nature of sustainability by bringing together authors from interdisciplinary backgrounds. The book highlights the opportunities and challenges associated with applying sustainability indicators in different socio-cultural and geographical settings. It presents a range of possible solutions to common challenges associated with the use of indicators in practice. Due to many challenges (i.e. climate change, energy, water and land shortage, high demands on food, land grabbing, etc.), agriculture production potential is expected to be seriously affected; thus, increasing food insecurity and hunger in many already affected regions (especially in Africa). In this context, sustainable agriculture is highly recommended as an eco-system approach where soil, water, plants, environment and living organisms live in harmony. Innovative technologies and research should be developed to ensure sustainable agriculture and productivity using modern irrigation systems, improved varieties, improved soil quality, etc. In the meantime, the preservation of natural environment should be based on resource conservation technologies and best management practices. Sustainable Agricultural Development, not only raises the serious ethical and social issues underlying these huge environmental problems, but also aims at presenting successful experiences from all over the world in relation with sustainable farming, sustainable management of water and land resources, and innovative processes in livestock production. It also aims at providing inputs to decision making processes and encouraging the transfer of relevant know-how, technologies and expertise to different countries where similar agro-climatic conditions may exist; thus saving precious resources and promoting sustainable agricultural development as a relevant approach to tackle the food security challenge. Finally, this book focuses on the paradigmatic and policy dimensions and call for an innovative approach by analyzing the key themes in a complex and interrelated manner.

The book integrates the fundamental factors that determine current and future impacts of biofuels production on water supply and demand in the context of climatic changes. The effects of biofuels production on ground water quality with increasing water scarcity are examined, and the utilization of water sources in the commercial scale production of biofuels are sketched, covering the complete route from growing of crops to biorefinery. Biofuel's chemical composition, characteristics and uses as fuel in terms of water consumption are also investigated. Overall, the diversity of biomass, various technological approaches and microbial contribution are reviewed. Learning objectives on this topic are presented by means of a series of tables and figures in order to guide both professionals and students. The present manuscript deals with biofuel and bioenergy courses and is therefore invaluable to students. The book provides thorough coverage of all industrial aspects of biofuels production, including impacts of climate change and water availability. It will play vital role for industry employees involved in product development, production management, quality management and helpful source to those studying for professional qualification. Academics involved in teaching elements of the subject and persons involved in an environment regulatory capacity would be able to take advantage from this book.

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