

# LOOKING AHEAD IN WORLD FOOD AND AGRICULTURE: Perspectives to 2050

*Edited by* **Piero Conforti**

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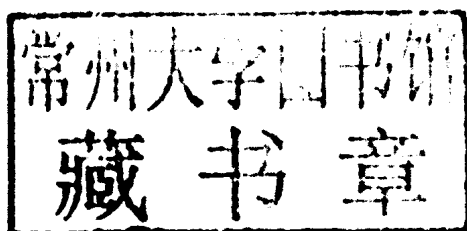
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AGRICULTURAL DEVELOPMENT ECONOMICS DIVISION  
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# LOOKING AHEAD IN WORLD FOOD AND AGRICULTURE: Perspectives to 2050

*Edited by* Piero Conforti



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## FOREWORD

Anticipating future developments in global agriculture is by no means a simple exercise. In the last few years, many of the acute phenomena observed have complicated further the formulation of long-term prospects. The turbulence of world agricultural markets, the price spikes of 2008 and 2011, the wide climate variability experienced in important production regions, and the enhanced linkage among agriculture and other markets such as the energy and the financial markets have propelled interest in revisiting the relations among agriculture, its natural resource basis, economic development, food security and population growth. Discussions of the relationships among these phenomena are lively, as are those on what can be done to prevent the onset of more frequent and more critical conditions in the coming decades.

Given its various fields of expertise, FAO is at the centre of the technical debate on these themes. In 2009, FAO organized an expert meeting and forum around the question of “How to feed to the world in 2050”. This initiative was supported by papers authored by world-class experts. This work has been revisited, and is now presented in this volume.

Several aspects of the perspectives for global agriculture are analysed. FAO’s last global projection exercise to 2050 indicates that agricultural and food demand is expected to slow over the next decades, following slowing population growth and raising incomes. However, population will still grow considerably in the coming decades, and require world agricultural production to increase substantially by 2050. The macroeconomic outlook indicates that economic growth may bring significant reductions in poverty in the 2050 horizon, but climate change may impose additional constraints, particularly through increased pressures on land and water resources. Biofuel development may be another source of stress for markets, depending on the ability of technology to reduce the overlap between energy feedstock and food products.

Other areas explored in the volume are natural resources – notably land and water – as well as capital, investment and technology. Regarding natural resources, the amounts of land and water available at the global level are most

probably sufficient to support the projected production increases. By 2050, the FAO baseline points to some net expansion of arable land, all in developing countries. However, the bulk of production increase will need to be generated through increased yields.

Technically, there seems to be considerable scope for pushing the agricultural technology frontier outwards. But much could also be done by simply applying existing technologies. To this end, farmers and other stakeholders along value chains need to receive the correct scarcity signals from markets to be able to access appropriate inputs and to invest. Global fixed capital stock in agriculture has been growing steadily over the last three decades, although at declining rates. Research is shown to be among the most productive investments for supporting agriculture, together with education, infrastructure and input credits. The concluding part of this volume takes stock of areas where consensus seems to emerge and those where controversies loom large. It identifies areas in which more information and analytical work are required and, last but not least, it provides insights into the strategies and policies to be enacted in support of global agriculture in the 2050 perspective.

In publishing this volume, FAO aims to keep the debate alive. The various chapters bring to the fore not only what we know about the long-term future of global agriculture, but also what we do not know, and the weaknesses of the methodologies used to make projections.

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The views expressed in this volume are those of the authors, and do not necessarily reflect the views of the Food and Agriculture Organization of the United Nations or its member countries.

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## ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ACS	agricultural capital stock
AEZ	Agro-Ecological Zone (model)
AGVP/PC	agricultural gross value of production per capita
AKST	agricultural knowledge, science and technology
ARI	agricultural research intensity ratio
AR4	Fourth Assessment Report (IPCC)
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASTI	Agricultural Science and Technology Indicators
AY	attainable yield
AYa	attainable yield under current economics
AYb	attainable yield under efficient institutions and markets
CAADP	Comprehensive Africa Agriculture Development Programme
CARD	Centre for Agriculture and Rural Development
CARDI	Caribbean Agricultural Research and Development Institute
CATIE	Tropical Agricultural Research and Higher Education Center
CBS	country balance sheet(s)
CDM	Clean Development Mechanism
CGE	computable general equilibrium (model)
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Center
CIRAD	International Cooperation Centre of Agricultural Research for Development
CO <sub>2</sub>	carbon dioxide
CSIRO	Commonwealth Science and Industrial Organization
CV	coefficient of variation
DEA	data envelopment analysis
DSSAT	Decision Support System for Agrotechnology Transfer
EM	expert meeting

ENVISAGE	ENVironmental Impact and Sustainability Applied General Equilibrium (model)
EU	European Union
FAPRI	Food and Agricultural Policy Research Institute
FBS	food balance sheet(s)
FDI	foreign direct investment
FT	Fischer-Tropsch (diesel)
FTE	full-time equivalent
FY	farm yield
GAEZ	Global Agroecological Zones Study
GCM	general circulation model
GDP	gross domestic product
GEO	Global Environmental Outlook
GHG	greenhouse gas
GIDD	Global Income Distribution Dynamics
GIS	Geographic Information System
GMC	global middle class
GTAP	Global Trade Analysis Project
HGCA	Home Grown Cereal Authority
HI	harvest index
HIC	high-income country
IAASTD	International Assessment of Agricultural Science and Technology for Development
ICOR	incremental capital output ratio
ICP	International Comparison Project
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IEA	International Energy Agency
IF	International Futures (model)
IFPRI	International Food Policy Research Institute
IIASA	International Institute for Applied Systems Analysis
IITA	International Institute of Tropical Agriculture
IMF	International Monetary Fund
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
IP	intellectual property
IPCC	Intergovernmental Panel on Climate Change

IR	Interim Report
IRD	Institute of Research for Development
IRRI	International Rice Research Institute
JIRCAS	Japan International Research Center for Agricultural Sciences
K	potassium
LMY	low and middle-income country
LUT	land utilization type
MARS	marker-assisted recurrent selection
MAS	marker-assisted selection
MDER	minimum daily/dietary energy requirement
MDG	Millennium Development Goal
MEA	Millennium Ecosystem Assessment
MIROC	Model for Interdisciplinary Research on Climate
MUV	Manufacturing Unit Value index
MV	modern varieties
N	nitrogen
NARS	National Agricultural Research Systems
NCAR	National Center for Atmospheric Research
NCD	non-communicable disease
NEPAD	New Partnership for Africa's Development
NUE	nitrogen use efficiency
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OFID	OPEC Fund for International Development
OPEC	Organization of the Petroleum Exporting Countries
P	phosphorus
PAR	photosynthetically active radiation
ppm	parts per million
PPP	purchasing power parity
PWT	Penn World Tables
PY	potential yield
PY <sub>w</sub>	water-limited potential yield
R&D	research and development
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
RUE	radiation use efficiency

SAP	standard accounting procedure
SAR	Special Administrative Region
SME	small and medium enterprise
SNS	sensitivity (scenario)
SOFI	The State of Food Insecurity in the World
SRES	Special Report on Emissions Scenarios
SUA	supply utilization account
TAR	target (scenario)
TDW	total above-ground dry weight
TE	transpiration efficiency
TFP	total factor productivity
TOE	tonne(s) of oil equivalent
TV	traditional varieties
UN	United Nations
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
WEO	World Energy Outlook
WFS	World Food System (model)
WTO	World Trade Organization

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