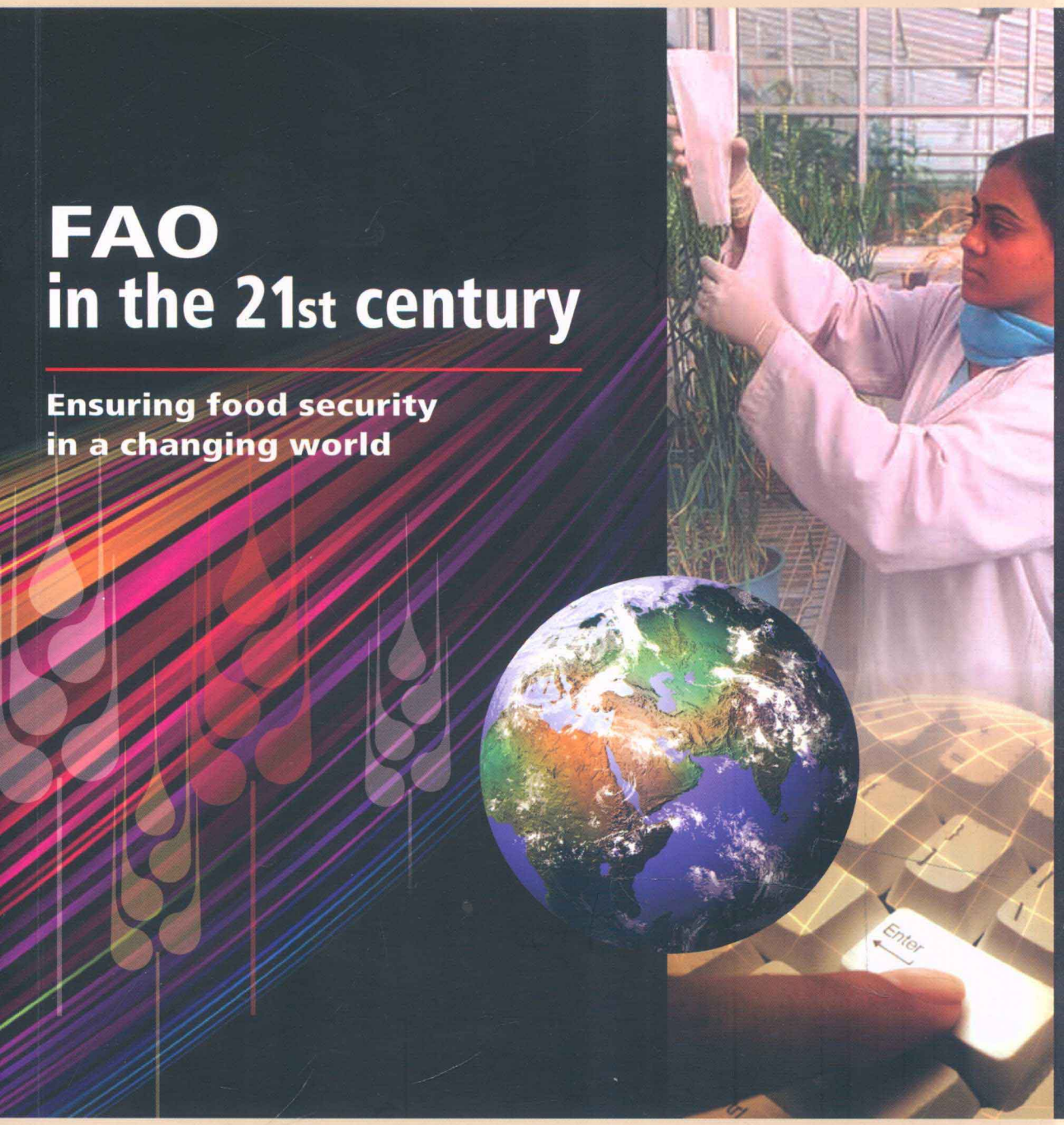
FAO in the 21st century

Ensuring food security in a changing world



Food and Agriculture Organization of the United Nations

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Foreword

If there is one clear and simple lesson to be learned from the experience of the last two decades, it is that fine words do not feed the millions of hungry people in the world.

There have been plenty of noble statements and promises made on significant occasions: at the World Food Summit in 1996; the Millennium Summit in 2000; the World Food Summit: *five years later*; the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy in 2008; and the World Summit on Food Security in 2009, to say nothing of G8 meetings and the Madrid ministerial-level meeting on "Food Security for All" at the beginning of 2011.

At the 2009 G8 meeting in L'Aquila, Italy, for the first time the priority was rightly given to increasing small farmers' production in developing countries. Nevertheless, the resulting pledges made for 2009, 2010 and 2011 are far from having been achieved.

I am not cynical; rather I am an optimist. Therefore I am still hopeful that the world's leaders will seriously and concretely address the plight of the hundreds of millions of poor women, men and children in developing countries who suffer chronic hunger and malnutrition.

The hunger situation is not only a question of economics and ethics. With the recent food crisis and riots, it is a matter that concerns peace and security in the world. Yet developed countries are responsible for a 43 percent drop in official development assistance (ODA) to agriculture over the last 20 years, and developing countries are allocating only 5 percent of their national budget to agriculture instead of the 10 percent necessary as a minimum, in view of agriculture's contribution to employment, balance of trade and GDP of these countries.

World leaders signed up to the World Food Summit Declarations and the Millennium Development Goals but poverty levels are rising uncontrollably. The more concerned members of the public are becoming more vocal, demanding effective action.

With honorable exceptions, on each major occasion many political leaders attempt to say something appropriate or promise corrective action so as to show concern and compassion and thus placate public opinion. With political horizons extending only as far as the date of the next election, however, the global implications of the increasing numbers of hungry, desperate and migratory people would appear to be less relevant than political standing as determined by opinion polls and the headlines generated by the 24-hour news cycle.

It is easier to provide much-needed money to bail out bankers than to address the world financial and economic crisis. Weapons trade also offers political and financial opportunities.

The failure to take effective action to reduce the number of millions of chronically hungry people cannot be blamed on a lack of information. FAO, drawing on the wealth of its global data and expertise, has played its part in analysing the complex issues related to food security and supporting countries in their efforts to combat hunger, within the limits of its resources, as this book amply demonstrates. Today much more is known about

who the hungry are, where they are, and why they are hungry. There is a better understanding of the interplay between climate and natural resources, of the role of globalization, trade and markets, and the subtle synergies and complexities of culture, communities and gender that can hinder or hasten development efforts. FAO has prepared dozens of anti-hunger plans and programmes, contributed to poverty reduction strategies and urged substantial increases in investment in agriculture. It has drafted bankable projects and proposals, developed systems to combat transboundary pests and diseases and assembled the statistical data that policy-makers need to take sound decisions.

FAO has also kept world leaders informed, regularly and comprehensively, about developments and trends in the field, and yet truly effective action has been disappointing to say the least.

While the fight against hunger is not possible with money alone, targeted investment is a crucial factor if poverty, hunger and malnutrition are to be reduced and eventually eradicated. It is not just FAO making this point: studies by national development agencies and many other development organizations have consistently confirmed FAO's conclusion that agriculture is the most effective driver of growth in the world's poorest countries. Raising agricultural productivity is essential for reducing rural poverty, improving food security and stimulating broad-based economic growth. But, as economists will confirm, growth does not come without investment – and investments in the rural areas of most developing countries have fallen far short of what is required.

Of course, it will be the private sector – all the way along the value chain from farm to consumer – that will make the most significant investments. Yet governments, supported by the donor countries and financing institutions, first need to create a favourable context and climate to encourage those investments. Roads in rural areas, storage facilities, irrigation, information and technology, secure land tenure systems are some of the key elements needed for a favourable investment environment. Still, the performance of many international financing institutions, including the global and the regional development banks, has been less than satisfactory, and the share of agriculture in their investment portfolios has been drastically reduced. If we do not wish to leave a legacy of economic and social turmoil, this trend has to be reversed now.

The other key factor is a supportive market. In addition to the basic infrastructure requirements for marketing their produce, agricultural producers and processors need to be assured fair prices on the market. They need information and tools to be informed of what those fair prices are. But how can local farmers compete when some of their governments often prefer to buy subsidized surplus produce from rich countries in order to keep food prices low for their urban populations? Thus the blinkered interests of leaders in wealthier countries, trying on their side to ensure the rural vote, and those in poorer countries, focusing on their sensitive constituency, have often coincided. Those who pay

the price are therefore the poor and hungry people living in the rural areas of developing countries.

FAO has worked, over the years, to give these people a voice, along with many others – NGOs, civil society and men and women of conscience – and to persuade those who have the power, to take action. This advocacy role will continue to be critical in the years ahead, as the Organization helps member countries face old and new challenges; challenges such as the increasing and ageing world population; urbanization; changing dietary patterns; variability and vagaries of climate; demands of bioenergy; the increased incidence of natural disasters; continuing gender and social inequalities; transboundary pests and diseases; pressure on natural resources, particularly land, water and biodiversity; and higher levels of migration and civil unrest.

In this book, FAO has described many of these challenges, indicating how the Organization has responded to date and how it proposes to continue doing so in the future. In the years ahead, FAO must continue to argue the case for sound investment in agriculture and rural livelihoods, and for a fairer world trading system, including a speedy and equitable conclusion to the Doha Round of multilateral trade negotiations. Its economists must continue to demonstrate that investment in poor countries has nothing to do with charity, which in any event is not what poor people want. It is about dignity, self-reliance and productive involvement. Ignoring or underutilizing the role and contribution of women, who constitute a majority of smallholder farmers in many developing countries, has a quantifiable cost. Striving to eradicate hunger in the world is not just a moral imperative, although it is certainly that, but it is an economic and political imperative too.

Over the years, we have gradually seen the issue of hunger and food insecurity creeping up the international agenda, and that is a cause for modest satisfaction and cautious optimism. In Africa, a number of governments have implemented policies that clearly demonstrate how significant progress in reducing hunger can be achieved if the will is there and it is a priority to do so. Latin America has committed to ending hunger by 2025. I remain optimistic that the job can be done, that hunger and undernourishment can be sustainably eradicated: perhaps not by 2015, but possibly by 2025, and surely by 2050. We know what is required of both developed and developing countries – political will, investments and a fair market environment. I want to believe that the world is not so indifferent to the plight of millions of poor and impoverished people that it will allow the current intolerable situation to continue.

FAO Director-General
Jacques Diouf

Editorial board

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PART 1: Major challenges to food security in the 21st century
***Chapter 1.* Hunger: taking stock of the global situation; Population: 9 billion people to feed in 2050:** Ali Arslan Gürkan, with substantial input from colleagues in the FAO Economic and Social Department; **Changing patterns of food consumption: Barbara Burlingame. *Chapter 2.* Land resources**: Parviz Koohafkan; **Water resources, Irrigation and implications of growing water scarcity**: Pasquale Steduto, Jacob Burke; **Forests; Mountains:** Eva Muller, Mette Loyche-Wilke, Susan Braatz; **Biodiversity:** Linda Collette, Damiano Luchetti, Interdepartmental Working Group on Biodiversity. ***Chapter 3.* Climate change impacts at different levels**: Michele Bernardi, Selvaraju Ramasamy, Hideki Kanamaru, Joachim Otte, Tina Farmer; **Adaptation and mitigation in agriculture:** Claudia Hiepe, Alberto Sandoval; **Energy for and from agriculture; Addressing the food-energy-climate change nexus:** Olivier Dubois, Alessandro Flammini, Florian Steierer, Simone Rose. ***Chapter 4.* International trade and market access:** Ali Arslan Gürkan, with substantial input from colleagues in the FAO Economic and Social Department; **Large land acquisitions for food exports**: Paul Mathieu, Pascal Liu; **Investing in agriculture:** Garry Smith; **Engaging the private sector in food security and sustainable development:** Doyle Baker; **Technology development, transfer and opportunities:** Divine Njie, Josef Kienzle.

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Abbreviations

AARINENA	Association of Agricultural Research Institutions in the Near East and North Africa
AfDB	African Development Bank
ACS	agricultural capital stock
AGORA	Access to Global Online Research in Agriculture
AIS	Agricultural Innovation System
AMIS	Agricultural Market Information System
APAARI	Asia-Pacific Association of Agricultural Research Institutions
AOA	Agreement on Agriculture
ADB	Asian Development Bank
BSE	bovine spongiform encephalopathy
CAADP	Comprehensive Africa Agriculture Development Programme
CFS	Committee on World Food Security
CFSAM	Crop and Food Security Assessment Mission
CGIAR	Consultative Group on International Agricultural Research
CGRFA	Commission on Genetic Resources for Food and Agriculture
CH_4	methane
CIARD	Coherence in Information for Agricultural Research for Development
CIMMYT	International Maize and Wheat Improvement Centre
CIS	Commonwealth of Independent States
CO_2	carbon dioxide
COAG	Committee on Agriculture (FAO)
COFI	Committee on Fisheries (FAO)
CP	Cooperative Programme (FAO)
CRBP	cereals, starchy roots, bananas and plantains
CSO	civil society organization
DAE	Department of Agriculture and Extension (Bangladesh)
DAC	Development Assistance Committee (OECD)
DES	dietary energy supply
DDR	Doha Development Round
DFID	Department for International Development (UK)
DRM	disaster risk management
DRR	disaster risk reduction
EBRD	European Bank for Reconstruction and Development
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
EPFL	European Professional Football Leagues
ESCORENA	European System of Cooperative Research Networks in Agriculture
EU	European Union
EUFF	European Union Food Facility

EUS	epizootic ulcerative syndrome
FARA	Forum of Agricultural Research for Africa
FAO	Food and Agriculture Organization of the United Nations
FARLAND	Future Approaches to Land Development
FCC	Food Chain Crisis Management Framework
FEWS NET	Famine Early Warning System Network (USAID)
FLO	Fair Trade Labelling Organizations International
FRA	Forest Resources Assessment
GAFSP	Global Agriculture and Food Security Program
GAIF	Global Agro-Industries Forum
GATT	General Agreement on Tariffs and Trade
GCARD	Global Conference on Agricultural Research for Development
GCHERA	Global Consortium of Higher Education and Research for Agriculture
GDP	gross domestic product
GFAR	Global Forum on Agricultural Research
GFRAS	Global Forum on Rural Advisory Services
GHG	greenhouse gas
GIEWS	Global Information and Early Warning System
GREP	Global Rinderpest Eradication Programme
HLPE	High-Level Panel of Experts (CFS)
HLTF	High-Level Task Force
IADB	Inter-American Development Bank
IASC	Inter-Agency Standing Committee
ICARRD	International Conference on Agrarian Reform and Rural Development
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICN	International Conference on Nutrition
ICT	information and communication technology
IDP	internally displaced person
IEE	Independent External Evaluation
IFAD	International Fund for Agricultural Development
IFAP	International Fund of Agricultural Producers
IFI	international financing institution
IFPRI	International Food Policy Research Institute
IIED	International Institute for Environment and Development
ILO	International Labour Organization
INCAGRO	Innovation and Competitiveness for Peruvian Agriculture Programme
IPA	International Plan of Action for FAO Renewal
IPC	International Planning Committee for Food Sovereignty
IPCC	Intergovernmental Panel on Climate Change

IPM	integrated pest management
ISFP	Initiative on Soaring Food Prices
ITC	International Trade Commission
ITTO	International Tropical Timber Organization
JECFA	Joint Expert Committees on Food Additives
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
JODI	Joint Oil Data Initiative (FAO/IAEA)
LACC	Livelihood Adaptation to Climate Change
LDC	least developed country
MDG	Millennium Development Goal
MICCA	Mitigation of Climate Change in Agriculture
NACA	Network of Aquaculture Centres in Asia-Pacific
NAFORMA	National Forest Monitoring and Assessment (United Republic of Tanzania)
NARS	National Agricultural Research System
NEPAD	New Partnership for Africa's Development
NGO	non-governmental organization
N_2O	nitrous oxide
NPFS	National Programme for Food Security
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
PEMS	Performance Evaluation Management System
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RPFS	Regional Programme for Food Secuirty
RVF	Rift Valley fever
SAI	Sustainable Agricultural Initiative Platform
SFL	Sustainable Food Laboratory
SIDS	small island developing states
SIK	Swedish Institute for Food and Biotechnology
SLM	sustainable land management
SMAE	small and medium-sized agricultural enterprises
SPFS	Special Programme for Food Security
SSC	South-South Cooperation
TCP	Technical Cooperation Programme
TFP	total factor productivity
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNSCN	United Nations Standing Committee on Nutrition
USA	United States of America
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAM	Vulnerability Analysis and Mapping (WFP)
VERCON	Virtual Extension and Research Communication Network
WEF	World Economic Forum
WFD	World Food Day
WFS	World Food Summit
WHO	World Health Organization
WTO	World Trade Organization

Executive summary

FAO's overriding mandate is to work with and assist its member countries and the international community in ensuring global food security, where "all people at all times have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". On a world scale, food production capacity is sufficient to satisfy this basic human right. Yet, both the number and proportion of undernourished in the world have increased in the last half decade, peaking in 2009 to more than 1 billion – one in seven – people.

The Organization's targeted measures to reduce poverty and hunger are underpinned by its unique global resource base: its multidisciplinary technical expertise; global statistical collation and impartial analysis; and legal policy advice and treaty depositories; as well as the innumerable international policy-making and standard-setting committees and commissions it hosts and the world summits it has organized. FAO actively supports member countries' initiatives for sustainable development, through the transfer and sharing of knowledge and by maintaining international awareness of the critical role of agriculture in global development.

Despite these comprehensive initiatives, a decade into the 21st century the world is facing a number of complex and interrelated challenges, which have serious implications for the efforts of FAO, its member countries and partners to achieve global food security:

- ***The world's population is rapidly expanding*** and is projected to reach 9 billion by 2050, with most of the growth in today's developing countries.
- ***Rural-urban migration is increasing considerably,*** again predominantly in developing countries, with urban areas accounting for 70 percent of the global population in 2050 (against today's 49 percent).
- ***Changing patterns in the types of food consumed*** are resulting from economic expansion, globalization and urbanization.
- ***Natural resources are being subject to unprecedented pressure*** from human activities.
- ***Marked climate and environmental changes are occurring,*** including more frequent disasters and emergencies.
- ***Globalization is affecting the agriculture sector and food security,*** with major implications for the free trade of food and access to markets and information as well as the availability of land for food production and food prices.

In addition, domestic and official development assistance for the agricultural sector is woefully insufficient, which is hampering efforts to attract private investment in food production, particularly by small-scale producers; and the agriculture sector's economic importance and potential in developing countries is not adequately reflected in formal domestic policy-making.

FAO in the 21st century: Ensuring food security in a changing world details the current knowledge of these phenomena and their key drivers. It discusses likely implications

for the food and agriculture sector and for hunger and poverty reduction efforts, including FAO's role in assisting member countries in the coming years.

Major challenges from the food security and agricultural perspective

Hunger: taking stock of the global situation

With a focus on FAO's continual efforts to enlist the concerted action of the international community, *FAO in the 21st century* recapitulates the key food summits and conferences called over the years. It devotes particular attention to the 1996 World Food Summit, discussing its ambitious target of halving the current number of undernourished people by 2015 as well as the UN Millennium Development Goal No. 1, which aims to halve, "between 1990 and 2015, the proportion of people who suffer from hunger". These targets have become the benchmark for monitoring progress in political action towards eliminating hunger, and the FAO methodology on which both are based is recognized as the only currently available method of calculating global and regional estimates of the prevalence of undernourishment.

Taking stock of the hunger situation today, *FAO in the 21st century* explains the 2009 peak in the number of hungry people, a consequence of the global food and fuel crisis of 2007–2008 and subsequent financial crisis (the "triple F" crisis). The effects of the disruption of global commodity markets, especially food, in this period led FAO to schedule the highly attended High-Level Conference on Food Security in 2008, followed by the 2009 High-level Expert Forum on "How to Feed the World in 2050", which preceded the World Summit on Food Security. In addition to obtaining renewed pledges on hunger reduction targets, the first event enabled FAO to communicate the key message that food security depends on increasing food production, particularly by small farmers in developing countries. The 2009 Summit also obtained the international community's commitment to improve international coordination and governance of food security, namely through reform of FAO's Committee on World Food Security; its promise to reverse downward trends in domestic and international funding for agriculture and food security; and its decision to promote new investments in agricultural production and productivity in developing countries in support of poverty reduction and food security.

Population, food demand and agricultural production

The role of the agriculture sector in driving economic growth that benefits the poorest and food-insecure is underlined throughout the book, as is the requirement for the sector to provide food, fibre and energy for a rapidly growing and urbanizing population, with changing dietary demands.

To satisfy the needs of 9.2 billion people in 2050, overall food production will have to increase by about 70 percent and production in the developing countries will virtually need to double. Demand for cereals for both food and animal feed will reach around 3 billion tonnes by 2050, compared with 1.8 billion tonnes today, and with the advent of

liquid biofuels, demand could increase even further. Demand for animal source foods – meat, dairy, fish and aquaculture products – as well as vegetable oils will grow even faster, largely as a result of higher incomes in developing countries. Livestock already constitute 30 percent of agricultural GDP in the developing world, and the subsector is one of the fastest-growing in agriculture.

To achieve sufficient increases in food production, agriculture will be obliged to rely on a smaller rural workforce, adopting more efficient and sustainable production methods, while at the same time adapting to and mitigating climate change.

The multidisciplinary food system approach is advocated as a necessary strategy for ensuring urban and peri-urban food quality through shorter food chains, strong urban-rural linkages and sound management of natural resources. Moreover, it is an essential measure for preparing for climate change.

Pressure on natural resources

Linking land and water management

The availability of quality land and water resources is critical for food security, and further intensification of their use is required to meet the world's food needs in the future. The negative effects already incurred by population pressure, dietary changes, biofuel production, pollution and unsustainable practices are clear from statistics in *FAO in the 21st century*, for example one-third of global arable land has been lost though erosion in the past 50 years, with ongoing losses of an estimated 10 million ha each year. This implies yet more conversion from prime grassland, woodland and forest ecosystems to compensate.

Rather than drastically changing land-use practices, the recommendation is broad adoption of adaptation and mitigation measures and a paradigm shift to land resource governance based on the principles of sustainable land management (SLM), which direct involvement of local land users and based on social, participative approaches. Among the intensive agro-ecology practices included in SLM are conservation agriculture, agroforestry and improved rainwater management.

Water has a crucial role in poverty alleviation and food security, and access to water resources is directly linked to land-use practices, both for intensive agriculture and animal production. The interface between land and water use rights is noted as a critical factor, including transparency and stability of tenure and use rights.

The management and control of freshwater to irrigate crops and water livestock will be essential for sustaining livelihoods and economic development in the future, particularly as growing consumption of animal protein continually increases water use for fodder crops and watering of livestock.

Growth in irrigation has been spectacular over the past 50 years, largely due to investment in necessary public goods as well as farmers' investment of capital in irrigation systems. It has enabled significant increases in productivity as well as reductions in hunger through increased food production and reductions in poverty through increased farm and non-farm rural employment. However, climate variability and depleted groundwater resources are now urgent challenges that call for greater knowledge and technology application, together with more strategic investment.

To support required productivity while mitigating environmental impacts, *FAO in the 21st century* recommends a return to an integrated, ecosystem approach to natural resource management that respects the integrity of linked land and water systems. Advanced technological knowledge needs to be combined with institutional approaches that are inclusive of land and water users. Conservation of forests and wetlands will be particularly important, owing to their role as regulators of the hydrological cycle.

Forests and mountains

Degradation of forest ecosystems through mismanagement, land conversion, fires and other causes – insect pests and diseases, natural disasters and invasive species – remains a serious challenge. In addition to providing forest products, forests and wooded land play an ever important role in conserving soil and water, biological diversity and mitigating climate change. While progress has been made in reversing loss of forest area, deforestation and uncontrolled conversion continue at an alarming rate in many countries – a phenomenon that is expected to worsen with population growth. In the case of land management, a cross-sectoral approach is required to achieve the goals of "no net loss" and sustainability. Likewise, in the face of pressures from population, globalized industry and agriculture and the consequences of climate change, sustainable management is advocated to maintain the integrity of mountain ecosystems, which are among the world's greatest sources of biodiversity for food security.

Achieving food security while conserving biodiversity

An integral and fundamental component of natural resources, biodiversity is threatened by the same factors that are degrading other resources. The Code of Conduct for Responsible Fisheries, the International Treaty on Plant Genetic Resources for Food and Agriculture and the Global Plan of Action for genetic resources in the different sectors, evidence the priority that FAO affords conservation and management of biodiversity in all sectors concerning natural resources use and food security. Above all, FAO stresses the need for more effective government leadership, improved resource stewardship, the application of an ecosystem approach in agriculture-related sectors, and greater investment in biodiversity.

■ Climate change

Manifested most notably in more frequent, extreme weather episodes and shifts in seasons, climate change is expected to affect food production in many areas of the world and to disrupt food distribution systems and infrastructure, particularly in the second half of the century. Less immediately apparent are the longer-term effects on ecosystems, including increased salinity and rising sea levels, and the shifts in the geographical distribution of plant, insect and animal species. Although climate change is a global threat, populations in developing countries, particularly in rural areas, are at greater risk because of the more limited means available for adaptation and mitigation. Furthermore, it is expected to increase the dependency of developing countries on imports and accentuate the existing concentration of food insecurity in sub-Saharan Africa and possibly South Asia.