

# 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

Rome, 2011

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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**

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# Abbreviations

<b>AARINENA</b>	Association of Agricultural Research Institutions in the Near East and North Africa
<b>AfDB</b>	African Development Bank
<b>ACS</b>	agricultural capital stock
<b>AGORA</b>	Access to Global Online Research in Agriculture
<b>AIS</b>	Agricultural Innovation System
<b>AMIS</b>	Agricultural Market Information System
<b>APAARI</b>	Asia-Pacific Association of Agricultural Research Institutions
<b>AOA</b>	Agreement on Agriculture
<b>ADB</b>	Asian Development Bank
<b>BSE</b>	bovine spongiform encephalopathy
<b>CAADP</b>	Comprehensive Africa Agriculture Development Programme
<b>CFS</b>	Committee on World Food Security
<b>CFSAM</b>	Crop and Food Security Assessment Mission
<b>CGIAR</b>	Consultative Group on International Agricultural Research
<b>CGRFA</b>	Commission on Genetic Resources for Food and Agriculture
<b>CH<sub>4</sub></b>	methane
<b>CIARD</b>	Coherence in Information for Agricultural Research for Development
<b>CIMMYT</b>	International Maize and Wheat Improvement Centre
<b>CIS</b>	Commonwealth of Independent States
<b>CO<sub>2</sub></b>	carbon dioxide
<b>COAG</b>	Committee on Agriculture (FAO)
<b>COFI</b>	Committee on Fisheries (FAO)
<b>CP</b>	Cooperative Programme (FAO)
<b>CRBP</b>	cereals, starchy roots, bananas and plantains
<b>CSO</b>	civil society organization
<b>DAE</b>	Department of Agriculture and Extension (Bangladesh)
<b>DAC</b>	Development Assistance Committee (OECD)
<b>DES</b>	dietary energy supply
<b>DDR</b>	Doha Development Round
<b>DFID</b>	Department for International Development (UK)
<b>DRM</b>	disaster risk management
<b>DRR</b>	disaster risk reduction
<b>EBRD</b>	European Bank for Reconstruction and Development
<b>EMPRES</b>	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
<b>EPFL</b>	European Professional Football Leagues
<b>ESCORENA</b>	European System of Cooperative Research Networks in Agriculture
<b>EU</b>	European Union
<b>EUFF</b>	European Union Food Facility



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

<b>IPM</b>	integrated pest management
<b>ISFP</b>	Initiative on Soaring Food Prices
<b>ITC</b>	International Trade Commission
<b>ITTO</b>	International Tropical Timber Organization
<b>JECFA</b>	Joint Expert Committees on Food Additives
<b>JMPR</b>	Joint FAO/WHO Meeting on Pesticide Residues
<b>JODI</b>	Joint Oil Data Initiative (FAO/IAEA)
<b>LACC</b>	Livelihood Adaptation to Climate Change
<b>LDC</b>	least developed country
<b>MDG</b>	Millennium Development Goal
<b>MICCA</b>	Mitigation of Climate Change in Agriculture
<b>NACA</b>	Network of Aquaculture Centres in Asia-Pacific
<b>NAFORMA</b>	National Forest Monitoring and Assessment (United Republic of Tanzania)
<b>NARS</b>	National Agricultural Research System
<b>NEPAD</b>	New Partnership for Africa's Development
<b>NGO</b>	non-governmental organization
<b>N<sub>2</sub>O</b>	nitrous oxide
<b>NPFS</b>	National Programme for Food Security
<b>ODA</b>	official development assistance
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OIE</b>	World Organisation for Animal Health
<b>PEMS</b>	Performance Evaluation Management System
<b>REDD+</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>RPFS</b>	Regional Programme for Food Security
<b>RVF</b>	Rift Valley fever
<b>SAI</b>	Sustainable Agricultural Initiative Platform
<b>SFL</b>	Sustainable Food Laboratory
<b>SIDS</b>	small island developing states
<b>SIK</b>	Swedish Institute for Food and Biotechnology
<b>SLM</b>	sustainable land management
<b>SMAE</b>	small and medium-sized agricultural enterprises
<b>SPFS</b>	Special Programme for Food Security
<b>SSC</b>	South-South Cooperation
<b>TCP</b>	Technical Cooperation Programme
<b>TFP</b>	total factor productivity
<b>UN</b>	United Nations
<b>UNCTAD</b>	United Nations Conference on Trade and Development
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme

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

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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

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### 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 through 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**

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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.

## Effects on ecosystems

The functioning of most of the world's ecosystems and the services they provide will be altered and risk being compromised in the coming decades, including capture and inland fisheries, an important source of food and livelihood for poor populations in Asia and Africa. The livestock sector, supporting the livelihoods and food needs of nearly 1 billion people, is both a contributor to and a victim of climate change. All stages of the livestock production cycle contribute to produce greenhouse gas (GHG) emissions, as does clearing of forest for pasture and feed crops. Livestock can also play a major role in mitigation, however, through the adoption of improved technologies and management practices that reduce GHG emissions from animal production and enable pasture and cropland to become net carbon sinks.

Climate change will have far-reaching consequences for animal production, through its effects on forage and range productivity. Resulting overgrazing and land degradation, shorter growing seasons and extreme weather events are likely to exacerbate food insecurity and may cause conflicts over resources.

The incidence, distribution and intensity of pests and diseases resulting from climate change may cause additional crises in plant and animal health, as crop weeds, insects and diseases expand and vector-borne diseases find new transmission pathways.

Human demographics also contribute to and are affected by climate change. Population growth and urbanization are a driver of increased CO<sub>2</sub> emissions, while it is also expected to be the trigger for widespread migration within and beyond national borders as people abandon the land and coastal and inland fisheries areas because production is no longer possible or viable.

## Adaptation, mitigation and climate-smart agriculture

Disaster risk management and adaptive change management are recommended as a matter of urgency, especially in vulnerable food-insecure countries, and *FAO in the 21st century* describes the Organization's activities and country support in these areas. Reducing Emissions from Deforestation and Forest Degradation (REDD+) is cited as one of the most cost-effective approaches to mitigation. It seeks to provide incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. Through REDD+ and other programmes, FAO supports countries' efforts in climate change mitigation by providing data, knowledge and technologies as well as supporting necessary institutional structures.

FAO policies and activities promote climate-smart agricultural practices as a means of adapting to and mitigating climate change. Many practices exist already: integrated rice farming systems, conservation agriculture, urban horticulture, integrated food-energy systems, low energy use aquaculture systems, sustainable forest and land management systems and agroforestry. The point underlined is that considerable investment is needed to fill data and knowledge gaps and provide incentives to encourage adoption of appropriate practices. Coherent policymaking across the different sectors involved, and effective natural resource policy, including use and property rights and law enforcement are also essential.



## Food-energy-climate change nexus

Addressing the food-energy-climate change nexus will be agriculture's greatest challenge this century. Significant increases in the current level of energy inputs into agriculture, particularly in developing countries, are necessary to satisfy the 70 percent growth in global food production required by 2050. To achieve these increases while reducing impacts on the environment, agriculture will need to become more energy efficient; food wastage must be minimized and the use of sustainable bioenergy and other renewable energy resources must increase.

A very important role can be played by the agriculture sector itself through the supply of bioenergy. The global potential of sustainable bioenergy production as a percentage of global energy is projected to reach about 30 percent by 2050. Liquid biofuels, especially, are among the most controversial of energy types, but *FAO in the 21st century* points out that, as with many agricultural products, the detrimental effects and benefits they may have are dependent on investment and management practices. Sound and participatory land-use planning and combined cultivation of food and energy crops, use of agricultural and forestry residues and contract farming to benefit smallholders are among the measures to be adopted to ensure sustainable biofuel production.

## ■ Managing globalization in the agriculture sector

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A key driver of change in agro-food systems worldwide is globalization, the growing integration of economies and societies around the world as a result of increased flows of information, capital, labour, technology, goods and services. It is spurred by four main factors: market liberalization, growth of international trade; increased international financial transactions and capital flows; and advances in information and communication technologies and logistics systems.

### Agricultural trade

In addressing the challenge of globalization, *FAO in the 21st century* underlines the importance of agricultural trade for poverty reduction and food security in developing countries and the need to establish a fairer system of trading rules for the sector. The complexity of globalization in the agriculture sector is illustrated by the failure of the several rounds of world trade negotiations over the past decades to reach a satisfactory agreement on agricultural products and markets. One of the main reasons why agreement has been so difficult to reach on many issues in the latest Doha Rounds is that many of the policy instruments that could help vulnerable countries improve their food security run counter to the prevailing spirit of liberalizing trade although at times not the actual practice – input subsidies are a prime example. Also considered is the trend towards use of private “standards” or measures applied by private firms, which remain outside the domain of the negotiations. Concern is expressed as the trend may continue to expand and to cover more food commodities, thereby posing risks for small producers in particular in developing countries and hindering their efforts to increase food production.

## Land acquisitions

The implications of the large-scale farmland acquisitions made over the past three years in Africa, Latin America, Central Asia and Southeast Asia are discussed from the perspective of world agriculture and food security in the future, including their potential effects on the relations between agribusinesses and smallholder farming. The land acquired is often state or public land (except in Eastern Europe and Latin America), and buyers are from both the private sector and governments and government sovereign funds. Most current deals have been concluded by European biofuel investors and Gulf State and Asian investors.

FAO is engaged in major global initiatives to address the situation, with a view to ensuring that such acquisitions are beneficial for the food security and development of the populations in the investing as well as the land-supplying countries. The development of *Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources*, recognizing the need to engage with indigenous and other community investors, recipient governments, private sector and civil society to ensure sustainable and transparent practices is a prime example. A second partnership initiative is the *Principles for Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources*, which include elements directly related to the linkages between large land acquisitions and food security.

## Investing in and mobilizing resources for agriculture

Both domestic expenditure and official development assistance (ODA) for agriculture have declined over the past 20 years, with ODA falling by 43 percent. While recent commitments by the international community to reverse the downward trend have improved the situation slightly, a massive capital input into the agriculture sector of agriculture-based and transforming countries is vital if the world is to reduce hunger and assure food security in the future. According to *FAO in the 21st century*, national public investment must be the primary source, strategically backed by ODA.

Perhaps more significant, however, is the need to support private enterprise, which is measured by agricultural capital stock (ACS). Agricultural production and marketing is very much reliant on ACS, which has been growing steadily over the past 30 years, although for most of this period at declining rates. It is noted that ACS growth is lowest in countries with the highest prevalence and depth of hunger.

Foreign direct investment (FDI) is also expected to play an increasingly important role. However, while FDI has increased in the last decade, inflows into agriculture represent a very small proportion of total FDI and of domestic private sector investment in agriculture. For FDI to be effective in achieving hunger reduction and poverty alleviation, countries need appropriate policy frameworks in place so as to attract more and better targeted investments in agriculture. The *Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources*, and the *Principles for Responsible Agricultural Investment*, cited in the previous section, as well as the *OECD Policy Framework for Investment in Agriculture* provide important conceptual frameworks aimed at enhancing the positive potential of FDI, while helping to avoid negative effects in recipient countries.

## Engaging with agricultural companies and industry organizations

FAO is extending its partnering strategy with the private sector, which has traditionally focused on collaboration with industry associations, to engage agricultural companies and business leaders in dialogue and the development of integrated, long-term strategic approaches that could not be attained by FAO and its members alone. There has also been a trend towards involvement of non-governmental stakeholders, including agricultural companies or their associations, in governance and standard-setting activities. The Committee on Commodity Problems and the Codex Alimentarius Commission are cited among others as examples.

In its field programmes, FAO regularly collaborates with companies, commercial service providers and private sector associations on value chain and subsectoral development projects. One of FAO's strengths highlighted by *FAO in the 21st century* is its support for innovation in pro-poor business models with particular attention to the producer-buyer relationship.

## Technology development and transfer

Organizational and institutional changes have been occurring in the agriculture sector of most developing countries: agribusiness enterprises are becoming larger and food is increasingly being retailed through formal outlets, including supermarkets, instead of local markets. While these developments clearly bring opportunities, they pose a challenge for small-scale farmers, traders and processors, who require access to productive technologies and support in skills upgrading to be able to participate competitively and cost-effectively in markets today and in the future.

In providing the required technologies, capacity building and logistical support, FAO is promoting value chain approaches. These entail systematic interventions that improve the efficiency of the chain as a whole, recognize the central role of the private sector and provide economic incentives to all actors in the chain.

# Towards the eradication of world hunger – FAO in action

## ■ Policy assistance

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Together with capacity building, policy assistance today is the area of greatest priority for member countries and requests are steadily increasing. Policy advice has been a core activity since FAO's inception, with methods of delivery and areas of focus evolving over time in response to emerging development issues, and major meetings and statutory committee sessions providing key fora for international dialogue and decision-making. Not surprisingly, current priorities reflect the very challenges highlighted by *FAO in the 21st century* as the major determinants of food security efforts in the coming decades.

Through high-level learning events, institutional capacity development has aimed at strengthening developing countries' capacity to participate in multilateral trade negotiations and to adjust their agricultural and trade policies effectively. An even more recent

initiative has entailed a series of regional policy seminars on policy responses to food price volatility suffered since the onset of the triple F crisis.

The link between migration, remittances and opportunities for investment in agriculture is the basis of activities aimed at assisting countries in the formulation of policies that channel remittances from citizens abroad into agriculture and rural development in home countries.

Other thematic issues for which policy options and support are being formulated include: rapid transformations in agriculture and the strong growth in demand; global threats to natural resources and ecosystems, particularly in relation to climate change; energy scarcity; and building resilience to the changing nature of disasters and food emergencies.

An important strategic change in FAO's policy assistance over the past 15 years has been the decentralization of this function – with national and regional advisory support primarily offered through decentralized offices, thereby capitalizing on local experience and expertise.

### **Addressing the gender gap**

Achieving gender equality plays a central role in improving food security and nutrition levels as well as in increasing productivity in all agricultural and rural sectors, and thus harnessing a nation's full potential: FAO has constantly aimed to provide gender-sensitive policy advice. Whereas “women” were initially the primary target in the policy process, more recently FAO has adopted a more effective gender-sensitive approach, preceding policy development with a thorough gender analysis and ensuring that advice is relevant to both men and women.

*FAO in the 21st century* underlines the key constraints and areas requiring action in order for the gender gap to be closed. Among these are the unpaid activities and “invisible” work carried out by women and their lack of access to education, training and information, mainstream employment, land, credit and markets.

### **Addressing land rights and tenure**

Weak governance of land and other natural resources hinders economic growth, sustainable use of the environment and food security. Elaborating on points discussed in relation to the challenges of natural resource management, climate change and globalization, *FAO in the 21st century* devotes a specific policy section to the central and potentially controversial issue of access and rights to land and other resources. It highlights the need to improve access to land – thereby heightening users' responsibility for land use – through: improved governance; redistribution; leasing; consideration of land issues in emergencies; attention to pastoral rights of access; and improved security of private tenure. Geospatial technologies are cited as important means used by FAO in its work to achieve improved governance in national and transnational contexts.

### **Civil society partnerships**

Picking up on FAO's extended partnering strategy discussed in relation to globalization in the agriculture sector, *FAO in the 21st century* discusses the importance of FAO's col-

laboration with civil society in policy development. While civil society organizations (CSOs) and non-governmental organizations (NGOs) have long been important partners for FAO, the relationship has become more institutionalized and effective over the past two decades, especially since the major summits of the 1990s. CSO/NGO participation and support was vital during that period, and has grown to become an indispensable component in global policymaking processes. This is perhaps exemplified by the new format of the Committee on World Food Security, which has broadened its reach to become the foremost inclusive international and intergovernmental platform dealing with food security and nutrition.

### ■ FAO as a results-based knowledge organization

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Central to FAO's mandate is its role in generating and disseminating information on the extremely wide range of issues that relate to food security. Seen as a trusted source of both technical and public information, FAO is in an authoritative position to frame international debate on key global challenges affecting food security in this century.

The rapid and continued development of information technologies over the past two decades has enabled the Organization not only to increase the outreach and impact of information provided to members and key audiences, but also to improve access to and exchange of knowledge by members and partners engaged in development and food security efforts. Likewise, new technologies and knowledge management tools have facilitated FAO's capacity development activities, a long-standing organizational priority that has been given even greater focus since the 2005 Paris Declaration on Aid Effectiveness – a key principle of which is for developing countries to set their own strategies for poverty reduction and institutional development.

### Strategic organizational reform

Since 1994, FAO has undertaken a series of internal reforms, the first of which reappraised priorities and clearly focused the Organization's work on food security so that it could address relevant issues more effectively. *FAO in the 21st century* considers key developments resulting from this reform, including establishment of the Special Programme for Food Security to boost smallholder production in low-income, food-deficit countries, and the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES). Project and policy services were boosted with the establishment of a new Technical Cooperation Department, while the creation of multidisciplinary teams in regional offices evidence FAO's move to a multidisciplinary and decentralized approach to its work.

In 2005 another set of reforms provided for further enhancement of multidisciplinary work in key areas such as knowledge management and capacity building, and climate change and bioenergy. A "farm to table" food chain approach was supported through programme and structural reforms, while a specific department was set up to enable a holistic approach to the Organization's work on natural resources management.

Following an independent external evaluation, implementation of the most recent set of reforms was initiated in 2009 and a new headquarters structure put in place in 2010. While the evaluation concluded that FAO provided a necessary global forum, combining the full range of disciplines required for the provision of technical and policy responses to the major challenges facing food and agriculture in the 21st century, it recommended even further reforms and administrative streamlining aimed at achieving a leaner, more responsive and results-based organization. These include measures to ensure that all FAO's resources work in synergy across geographic and sectoral boundaries and with improved balance between headquarters and decentralized offices. Improved collaboration between FAO and partner organizations is also underlined as an important development objective as part of a reform area referred to as "Functioning as One".

### **FAO in action**

In focusing broadly on the challenges that FAO and its Members are facing this century, *FAO in the 21st century* illustrates a number of current activities, most of which build upon past achievements and lessons learned in earlier development contexts. It also identifies future directions to be taken and recommends action by FAO, together with its member countries and partners. In line with the Organization's strategic reform, all such priority-setting, resource management and programme design will be in the context of a results-based system and guided by the Strategic Framework for 2010-19, which articulates global goals sought by members as follows:

- Reduction of the absolute number of people suffering from hunger, progressively ensuring a world in which all people at all times have sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life;
- Elimination of poverty and the driving forward of economic and social progress for all, with increased food production, enhanced rural development and sustainable livelihoods;
- Sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources, for the benefit of present and future generations.



**P A R T**



**Major challenges to food  
security in the 21st century**





## CHAPTER 1

# Population dynamics and hunger

## Hunger: taking stock of the global situation

When addressing the challenge of eradicating chronic hunger and malnutrition in the decades to come, it is critically important to understand the full dimension of the problem. It is not just a question of producing more food, but of understanding population dynamics and changes in food consumption. These are the fundamentals that inform all related policy decisions.

The world produces enough food to feed everyone, yet nearly 1 billion people remain hungry. Hunger affects certain populations in all continents, in both developed and developing countries and in urban and rural areas. Without a doubt, the challenge of eradicating hunger is daunting, and attempts at both national and international levels have not proved very successful. As data reported in this chapter clearly demonstrate, world food security remains an uncertain prospect.

During global crises, debate about how to reduce hunger figures high on the international agenda, as it did during the world food crisis of 1974 and as it has since

### BOX 1

#### FAO keeps hunger on the global agenda

FAO launched Freedom from Hunger, its first public awareness campaign in 1963. In 1992, together with the World Health Organization (WHO) and in collaboration with the United Nations Children's Fund (UNICEF) and the World Food Programme (WFP), FAO convened the landmark International Conference on Nutrition. It then invited heads of state to the 1996 World Food Summit (WFS), and called them back for the World Food Summit: *five years later*. In 2008, with the sudden increase in food and fuel prices, FAO responded by organizing a High-Level Conference on World Food Security, which provided a global arena for discussion of the challenges these developments posed. In October 2009, when the situation had been compounded by the impact of the global financial crisis and the number of the hungry rose to more than 1 billion, FAO responded by organizing the High-Level Expert Forum on How to Feed the World in 2050. A month later, FAO hosted the World Summit on Food Security, where it opened a petition for signature as part of its *1billionhungry* campaign. So far, the petition has been signed by nearly 3.5 million people. Currently, together with WHO and other members of the United Nations Standing Committee on Nutrition (UNSCN), FAO is preparing for the second International Conference on Nutrition, or ICN+20.

2007, with the onset of the food, fuel and financial (triple F) crisis. Yet, for more than 65 years now, the Food and Agriculture Organization of the United Nations (FAO) has made a concerted effort to keep the hunger issue constantly high on the international agenda. With the expertise of its technical divisions in the areas of agriculture, forestry, fisheries, natural resources and economics and trade, FAO has gathered, analysed and disseminated information to specific audiences with the goal of raising and maintaining awareness of the challenges hundreds of millions of people face each day in obtaining enough food to sustain healthy lives.

### ■ Identifying the hungry

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It is well understood that extreme poverty is at the root of chronic hunger and malnutrition: the hungry, as defined by FAO in terms of food security, are those people who do not have “physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” at all times (FAO, 1996a).

While the hungry can be found in rural and urban areas of all countries, they are more likely to live in the rural areas of developing countries, as that is where nearly three-quarters of the world’s poor live. Even the hungry in the urban areas of developing countries are likely to be recent migrants from rural areas, forced to move because of lack of livelihood opportunities.

The hungry in rural areas are mostly from households engaged in subsistence farming or they work for others, selling their labour as agricultural workers. They lack the livelihood assets as well as physical, natural and financial resources needed to generate sufficient income to ensure family food security. They often also lack the expertise, training and education needed to improve their productivity and incomes or to find alternative employment opportunities. While a lot depends on people’s socio-economic, political, cultural and natural environments, there are a host of other external factors that affect the poverty and food security of rural and other food-insecure households. These include rural infrastructure, such as roads, communication or electrical systems; and institutional set-ups, such as markets, social safety networks, research and development, education and training, and health, legal, finance and credit systems as well as existing policy environments and political systems. Figure 1 summarizes the multitude of factors and complexity of the processes that underpin food security status at the household level.

In addition to these external factors, there are certain “care factors” that affect the nutrition security of household members. These include childcare, eating habits and practices, nutritional education, food preparation, and the social and cultural norms that determine how food is distributed and utilized within a household (IFAD, FAO and WFP, 2000).

### ■ Estimating the number of hungry

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Although defining who the hungry are is conceptually straightforward, determining the number of hungry with any degree of precision is a more difficult process.

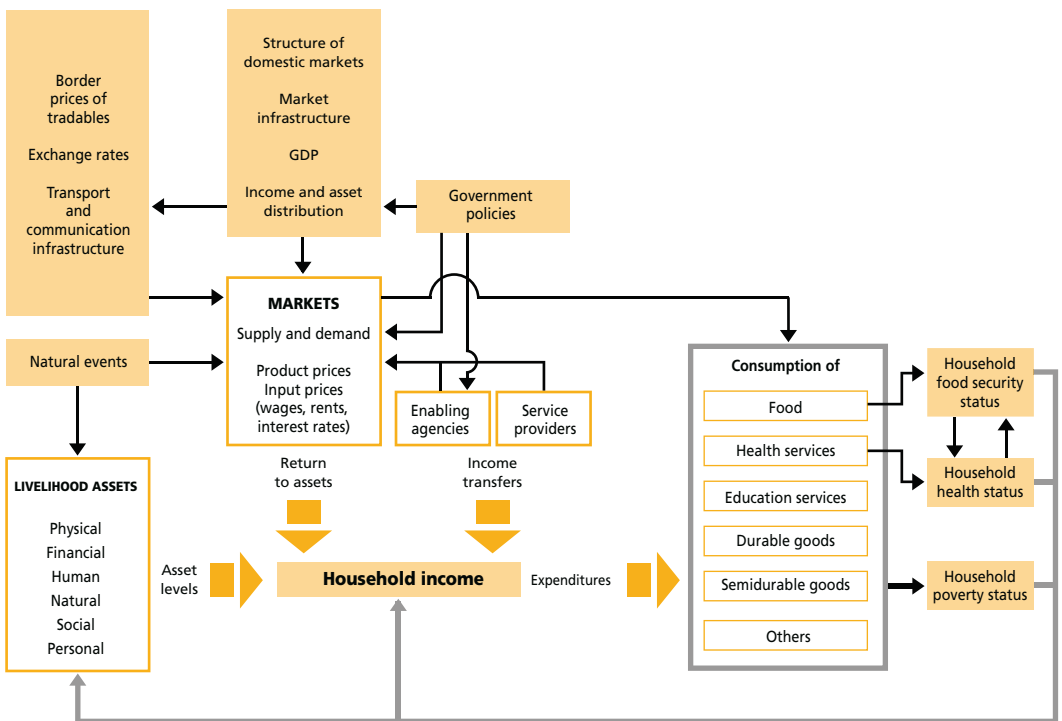
Developed countries that have well-developed social safety networks come closest to providing accurate estimates. However, for most developing countries, even an estimate requires the use of indirect methodologies, entailing brave underlying assumptions. Recognizing the critical need for this type of baseline data (see Box 2), as early as 1963 FAO began developing a methodology based on estimations of the inadequacy of calorie intake at the country level (FAO, 1963). Subsequently, in 1977, 1987 and 1996 (FAO, 1977, 1987, 1996b), FAO published regional and global aggregates of the number and proportion of hungry based on that indicator, although without revealing the estimates for the individual developing countries used in the aggregations. FAO's estimates of the proportion of populations found to be undernourished were used at the country level to derive an index of food security for the purpose of comparing the food security status of its 91 developing country members in 1993 (FAO, 1994) on the occasion of the 19th Session of the Committee on World Food Security (CFS).

### Setting global targets to end hunger

It was only after the 1996 World Food Summit that FAO's estimates became a benchmark for monitoring progress in political action towards eliminating hunger.

FIGURE 1

#### Factors and processes affecting household poverty and food security



**BOX 2****Estimating undernourishment: FAO methodology**

The FAO methodology used to estimate the number and proportion of undernourished people (FAO, 2004a, p. 14) is based on the calculation of three key parameters for each country: i) the average amount of food available per person; ii) the level of inequality in access to that food; and iii) the minimum number of calories required for the average person.

The average amount of food available is drawn from country “food balance sheets”, which FAO compiles annually for each country as follows:

- a calculation is made of the amount of each food commodity that is produced and imported by a country, and withdrawn from stocks;
- the amount that is exported, wasted, fed to livestock or used for other non-food purposes is subtracted from this; and
- the caloric equivalent of the resulting total amount of food available for human consumption is divided by the total population.

The end result of this calculation is an average daily food intake or dietary energy supply (DES) by country.

In addition, household survey data are used to derive a “coefficient of variation” to account for the degree of inequality in access to food within a country. Similarly, since a large adult needs almost twice as many calories per day as a three-year-old child, the minimum requirement per person for each country takes into account its mix of age, gender and body sizes. FAO reports the proportion of the population whose daily food consumption falls below that minimum daily requirement as being undernourished.

An International Scientific Symposium on Measurement of Food Deprivation and Undernutrition, held in 2002, concluded that FAO’s methodology is the currently available means of estimating prevalence of undernourishment at the global and regional levels (FAO, 2003a, p.6).

This was based on a pledge made by the heads of state and government or their representatives who attended the WFS in 1996. They committed themselves to achieving global food security and pledged “an ongoing effort to eradicate hunger in all countries”, setting a goal of reducing the number of undernourished people to half its 1990–1992 level no later than 2015 (FAO, 1996a). At that time, the estimated number of hungry in developing countries was 842 million, representing 16 percent of the world’s population.

The individual estimates for developing countries were first published in 1999, in the first edition of *The State of Food Insecurity in the World*, and have been updated and published in subsequent issues. Today, these estimates not only provide the basis for monitoring and analysing progress towards achieving the WFS goals, they also contribute to monitoring progress towards the first United Nations Millennium

## BOX 3

### Significance of the WFS and MDG targets

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- **WFS: Reduce by half the *number* of hungry people by 2015**
- **MDG 1: Reduce by half the *proportion* of hungry people by 2015**

Although the WFS and MDG targets use the same methodology, the WFS target is the more ambitious. Indeed, continued population growth means that the proportion of hungry people in the developing countries will need to be cut by much more than half if the WFS target is to be met. If the MDG target is achieved in 2015 by the developing countries as a group, current population projections suggest that the world will still have around 585 million undernourished, far more than the WFS target. On the other hand, reaching the WFS target will require a reduction in the proportion of undernourished in the developing countries to 7 percent, which is still 6 percent lower than the 13 percent level estimated for 2005–2007, the most recent period for which official data are available.

Development Goal (MDG 1): to eradicate extreme poverty and hunger.<sup>1</sup> Specifically, the hunger estimates assess the efforts of United Nations (UN) members in achieving the target of “halving, between 1990 and 2015, the proportion of people who suffer from hunger”. FAO’s Committee on World Food Security (CFS) played an important role in ensuring that the indicator is used for purposes of monitoring the two targets (FAO, 2001). Although seemingly similar, the WFS goal of halving the “number” of hungry and the MDG target of halving the “proportion” of hungry seek different outcomes, as shown in Box 3.

Figures 2 and 3 illustrate the trends in the number and proportion of undernourished people at the global level between 1969–1971 and 2010. Until recently, the methodology averaged three consecutive years in the calculation of the two indices, in order to smooth out the effects of short-term phenomena, such as seasonal crises. However, due to the nature and severity of the food and fuel crises of 2007–2008 and the ensuing financial crisis, the indices at the global and regional levels have been calculated and reported annually since 2008.

### Global trends in progress towards targets

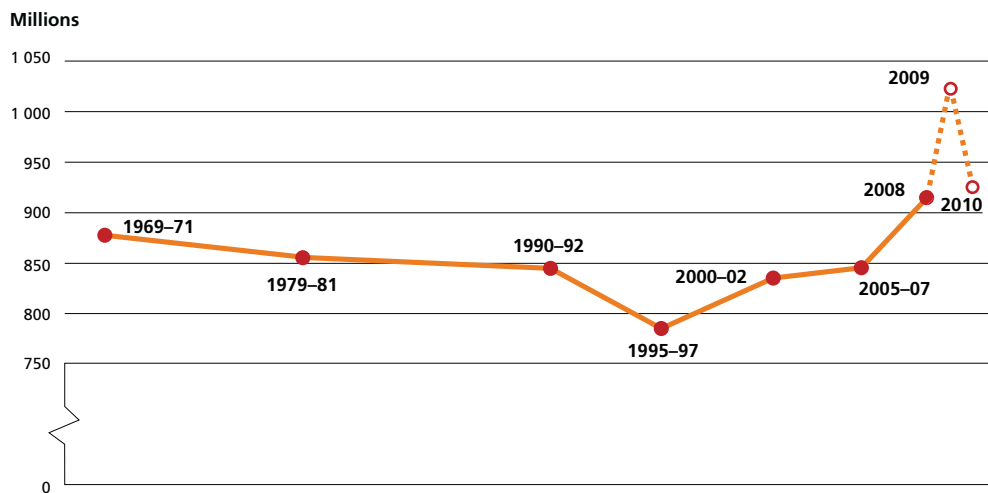
From the early 1970s to the mid-1990s, both global indicators showed downward trends. The number of hungry people dropped from around 878 million to around 738 million, and the prevalence of hunger dropped from 26 percent to 14 percent.

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<sup>1</sup> These FAO estimates constitute indicator 1.9 used in assessing the efforts made towards achieving target 1.C of the first MDG. These and other data used in monitoring the progress towards achieving the MDGs can be accessed at: <http://unstats.un.org/unsd/mdg/Data.aspx>.

FIGURE 2

## Number of undernourished people in the world, 1969–71 to 2010

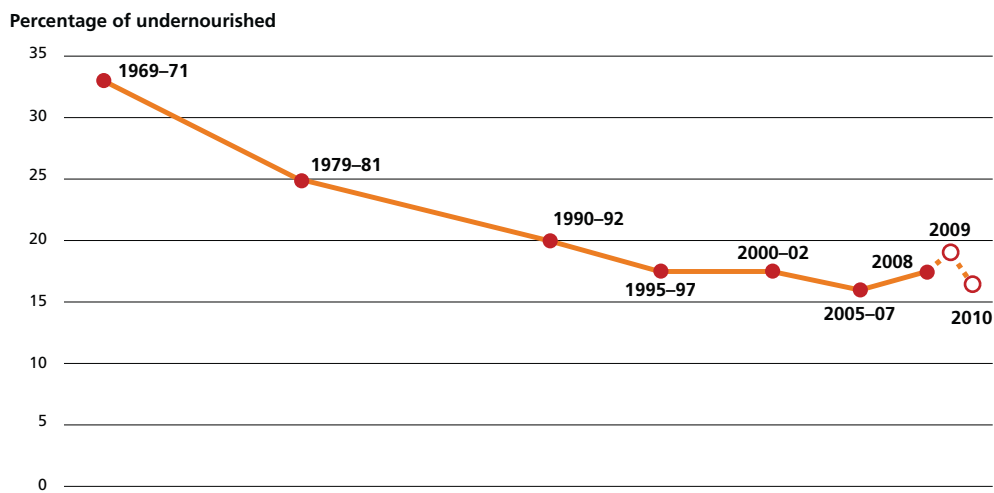


Note: Figures for 2009 and 2010 are estimated by FAO with input from the United States Department of Agriculture, Economic Research Service.

Source: FAO, 2010a.

FIGURE 3

## Proportion of undernourished people in developing countries, 1969–71 to 2010



Note: Figures for 2009 and 2010 are estimated by FAO with input from the United States Department of Agriculture, Economic Research Service.

Source: FAO, 2010a.



From then onwards, the global trends diverged. The number of hungry rose to around 848 million by 2005–2007, while the prevalence fell slightly to 13 percent during the same period. The trends then converged with the onset of the triple F crisis: in 2009, the number of hungry rose steeply to more than 1 billion and the prevalence of hunger rose to nearly 20 percent. The estimates for 2010 indicated a slight improvement at the global level to 925 million (FAO, 2010a).

The trends at the regional, subregional and country levels have been far more variable. For example, in Asia and the Pacific, the number of hungry began rising in early 2000, mainly because of poor performances by some countries in South Asia. East and Southeast Asia did much better. The performance of countries in Latin America and the Caribbean was more encouraging, with the region as a whole exhibiting continuous improvement, although some countries were not able to share in that achievement. Africa as a region was unique in that it was not the improvements but the failures that were continuous. Very few countries succeeded in reducing the number of hungry over a period of more than 15 years. Apart from those that already had very low levels of hunger, fewer than ten were successful in achieving mostly modest improvements, and only three achieved the WFS target for 2005–2007.

This variability and, in many instances, the inability to be on track to achieve either of the two targets stem from the multidimensional and complex nature of food security and nutrition. It reflects differences in countries' policies, economic, social and cultural environments and natural resource endowments.<sup>2</sup>

The fact that many countries were not successful in meeting their WFS targets clearly indicated the need for a broader alliance at the international level to accelerate action to reduce world hunger. This led FAO to call a second summit, the World Food Summit: *five years later*, in 2002, to encourage countries to reaffirm their commitments. The global events that began in 2007 further highlighted the importance of such collaboration, especially when the impacts portended such dire consequences for so many people in many vulnerable countries.

The memory of the 1974 food crisis had faded when, nearly half a century later, developments at the international level again disrupted global commodity markets, including many food commodities. Understanding the underlying causes of those developments was essential if there were to be appropriate international and national responses that could lessen their negative impacts on food security. FAO responded once more by organizing meetings and summits to raise awareness of the problems, seek solutions and achieve coherence in policy responses.

### **Progress hampered in 2007–2009**

The causes of the global food and fuel crisis of 2007–2008 and the global financial crisis that immediately followed were quite different, but both played primary roles in reversing, halting or slowing progress towards achieving the WFS and MDG 1 targets. Their effects on the food security of vulnerable groups in vulnerable countries

<sup>2</sup> For an empirical analysis identifying the factors responsible for the changes in the number of undernourished in the developing countries during the 1990s, see FAO, 2003a.



were similar, because both led to significant declines in real household incomes. However, there were differences between the countries and the households that they affected. Countries and households that were net importers and consumers of food and fuel stood to lose the most in a crisis caused by a hike in international food and fuel prices.<sup>3</sup> However, when the cause was financial,<sup>4</sup> the countries to be most affected were those that had large account deficits and thus faced sharp devaluations of their currencies. They experienced severe credit constraints and falling real GDP, with vulnerable populations experiencing sharp declines in their incomes as a result. Those households affected by both crises were, of course, the hardest hit.

The fact that the number of hungry rose to 1 billion in the face of the triple F crisis in 2009 indicated how many households in developing countries did not have the livelihood entitlements to cope with the decline in their real incomes and had to resort to adjusting their food consumption, which resulted in undernutrition. This happened despite increases in the incomes of producers who had marketable surpluses and who could therefore benefit from the soaring international prices of agricultural commodities.

### **Addressing old and new challenges to eliminating hunger**

The problems brought by the triple F crisis compounded longer-standing challenges that the international community and governments had committed to address in various conferences and fora. International agricultural commodity markets had been tightening for some time prior to the onset of the food and fuel crises.

On the supply side, the challenges were, and still are: i) a lack of investment; ii) slowing growth in yields; iii) agriculture's declining share in development aid; and iv) a declining availability of funds for research and development.

On the demand side, the challenges posed were, and still are, i) an increase in the demand for food, stemming from changing patterns of consumption in emerging economies experiencing rapid economic growth; and ii) continued population growth and urbanization in many developing countries.

When these problems occur in a context of declining levels of global stocks,<sup>5</sup> any supply or demand shock might lead to a significant increase in the level as well as the volatility of prices.

That is precisely what happened in 2007, owing to record oil prices and droughts in major exporting countries. Oil prices had an impact on the demand side, because a resulting increase in demand for biofuel production resulted in energy crops competing with food crops in the field. On the supply side, high oil prices increased

<sup>3</sup> Several FAO documents and publications provide detailed explanations as to the underlying causes of the food and fuel crisis and the nature of the impacts on food security on developing countries and vulnerable groups (FAO, 2008a, 2009a).

<sup>4</sup> See FAO, 2009b.

<sup>5</sup> The decline in the level of global stocks of many agricultural commodities occurred because of the implementation of multinational trade agreements that reduced publicly held stocks, the high cost of storing perishable products, the development of other less costly instruments of risk management, increases in the number of countries able to export, and improvements in information and transportation technologies.

the cost of producing and transporting agricultural commodities. Other challenges, such as foreign exchange volatility and an increase in speculative activity in derivative agricultural markets, further complicated and disrupted agricultural commodity markets.

Both the old and the new challenges remain, mainly because neither the international community nor national governments have devoted sufficient resources to addressing this very complicated set of problems. While lists of corrective measures have been formulated, they have still to be prioritized and their implementation effectively scheduled. The political will, required competencies and resources have also been seriously lacking to date. The fight against hunger is taking place in an interdependent, uncertain, mobile and violent world, where national interests are still paramount.

### ■ **Hunger and poverty decrease as economies transform**

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The experience of countries that have succeeded in reducing hunger and malnutrition shows that economic growth and poverty reduction policies, as such, do not automatically ensure success. The source of growth matters too. Cross-country analyses show that gross domestic product (GDP) growth originating in agriculture is, on average, at least twice as beneficial to the poorest section of a population as growth generated in non-agricultural sectors. This is not surprising, considering that 75 percent of the poor in developing countries live in rural areas and derive a significant part of their livelihood from agriculture and related activities. For agriculture-dependent countries in particular, agricultural growth is pivotal for overall growth and development as well as for poverty reduction.

Many developed countries based their successful economic transitions on vibrant agricultural sectors. It was the precursor to the industrial revolutions in Europe and the United States of America (USA) and, more recently, to those in China, the Republic of Korea, Thailand, Viet Nam and other rapidly growing Asian economies. During these transformations, investment in agriculture and education created agricultural surpluses, kept real food prices low and helped stimulate overall economic growth. At the same time, overall economic development created new employment opportunities that helped absorb the rural labour surplus that emerged from the transformation of agriculture. The result has been a transition from many small subsistence producers in those countries to fewer and larger commercial farmers, more non-farm employment and larger farm operations overall.

The outlook to 2050 suggests that many developing countries will be on the pathway to such a transformation. While the role of agriculture as a driver of overall growth is expected to diminish over time along with its share in GDP, the experience of today's middle-income countries suggests that agriculture's role in poverty and hunger reduction will continue to be significant. Agriculture's contribution to hunger reduction consists of more than just producing food where needs are most pronounced. Agriculture also contributes by creating employment, generating income and supporting rural livelihoods.

## Population: 9.2 billion people to feed in 2050

The world's rapidly increasing population puts pressure on all aspects of human existence and must be superimposed over all efforts to achieve food security. With the world's population expected to reach 9.2 billion by 2050, no sector feels the pressure more dramatically than agriculture, which will need to produce food for 2.3 billion more people than at present.

To meet this demand, agriculture must produce more food, feed, fibre and biofuel feedstock from a finite resource base and with a smaller rural labour force. It must also be able to contribute to overall development in agriculture-dependent developing countries, reduce pressure on natural resources by adopting more efficient and sustainable production methods and adapt to climate change.

### ■ Preparing for future scenarios

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Nearly all of the world's population growth is forecast to take place in developing countries, with sub-Saharan Africa's population growing the fastest, increasing by 114 percent by 2050, and East and Southeast Asia's the slowest, increasing by 13 percent by 2050. Urbanization is foreseen to continue accelerating – 70 percent of the world's population will live in urban areas by 2050, compared with 49 percent today. Rural populations will actually decline, after peaking sometime in the next decade, and urban dwellers will rely on purchasing rather than growing their own food.

At the same time, per capita incomes in 2050 are projected to be a multiple of today's levels, with relative inequality in incomes being considerably reduced, as the recent trend of developing country economies growing significantly faster than those of developed countries is likely to continue in the future.

The process of producing projections for global production, consumption and trade of agricultural goods and the number of hungry for the future is difficult and outcomes are uncertain. Nevertheless, informed estimates are necessary to gauge a plausible range of outcomes and develop an appropriate range of actions to cope with them.

Estimates from “most likely” scenarios, and from scenarios that consider the possible effects of climate change and increased bioenergy demand, underline the importance and urgency of establishing effective poverty reduction strategies, food security and nutrition initiatives, safety nets and rural development policies and programmes focused on increasing smallholder agricultural production and productivity in developing countries. These measures are, of course, no different from those addressing current food security issues.

### **Food demand and production**

Feeding a global population of 9.2 billion will require an increase in overall food production of some 70 percent between 2005/07 and 2050. Production in the developing countries will almost need to double.

Demand for cereals for both food and animal feed will reach about 3 billion tonnes by 2050, up from today's estimated 1.8 billion tonnes. Liquid biofuels have the potential to change some of the projected trends and increase world cereal demand, although their production and impact will depend mainly on energy prices and government policies. Other food product demand that is related to higher incomes in developing countries – such as meat demand for dairy, fish and aquaculture products and vegetable oils – will grow much faster than demand for cereals produced for food. Livestock already constitute 30 percent of agricultural GDP in the developing world, and the livestock subsector is one of the fastest-growing in agriculture.

The expected growth in purchasing power in developing countries will lead to dietary changes that are increasingly orientated towards animal source foods and away from staple foods of vegetal origin. Overall meat consumption in developing countries is expected to account for around 82 percent of projected global growth in the next decade. Much of this expansion will take place in the Asia and Pacific region, especially in China, and in Latin America, led by Brazil, and it is expected to outpace growth in member countries of the Organisation for Economic Co-operation and Development (OECD) by a factor of 2:1 in the next decade. Renewed investment, capacity development, improved infrastructure and the introduction of modernized, intensive and integrated production technologies are the main factors spurring higher growth in the former group of countries, and this is especially true for poultry in China, Brazil and India and, to some extent, in the Commonwealth of Independent States (CIS).

### International trade

Trade in agricultural commodities is expected to expand considerably. For example, developing countries' net cereal imports will increase almost threefold to reach nearly 300 million tonnes by 2050 which, by then, will account for some 14 percent of their cereal consumption, up from 9.2 percent in 2006–08. Self-sufficiency in cereals would continue to be low in the Near East and North Africa, the region most dependent on food imports. At the other extreme, Latin America and the



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**PHOTO 1**

Food production in the developing countries will almost need to double to meet overall needs in 2050.

Caribbean, now a net cereals-deficit area, may become fully self-sufficient, reflecting the surplus production potential of major countries in the region. The other regions may see some decline in self-sufficiency, but they will remain in the 80–95 percent range compared with 83–100 percent at present.

### Natural resources

More than 90 percent of the growth in crop production globally (more than 80 percent in developing countries) will result from higher yields and increased cropping intensity, with the remainder coming from land expansion. The expansion in arable land will be about 70 million ha (or less than 5 percent) up to 2050, with the expansion of about 110 million ha (or 11 percent) in developing countries being offset by a decline of some 40 million ha (or 7 percent) in the developed countries. However, after 2050, total arable land in the world is expected to decline from 1 660 to 1 630 million ha in 2080. At that point, South and East Asia and the Near East and North Africa will be at the level of the developed countries in terms of declining arable land, while land expansion will continue in all of sub-Saharan Africa and, to a lesser extent, in Latin America.

Land equipped for irrigation is expected to expand by some 22 million ha (7 percent) by 2080, although with virtually no further growth after 2050. The harvested irrigated area could expand by some 40 million ha (12 percent) up to 2050 but would decline afterwards. In this case, the equipped area would not change, as the infrastructure is already in place, but its utilization – and maintenance – would decline. Nearly all of this increase would be in the developing countries. Water withdrawals for irrigation would grow at a slower pace but still increase by almost 6 percent (or some 165 km<sup>3</sup>) by 2050, mainly (but not only) due to a slowly improving efficiency in water use. After 2050, water withdrawals should start to decline as a result of the declining harvested irrigated area but also because of a decline in harvested rice area and its intensive water use for flooded paddy fields. The exceptions are sub-Saharan Africa and the Near East and North Africa, where water withdrawals would continue to grow.

Crop yields would continue to grow but at a slower rate than in the past. This process of decelerating growth has been underway for some time. On average, the annual rate of growth in crop yield for the projection period is expected to be about half (0.8 percent) of its historical rate (1.7 percent), although these rates would be 0.9 and 2.1 percent, respectively, for developing countries. The question is whether the world's resource base can support these projected and needed increases in land, water use and yields.

**Land resources.** In a global agro-ecological zone study (Fischer *et al.*, 2002) providing a comprehensive assessment of the impacts of climate change on agro-ecosystems this century, FAO and the International Institute for Applied Systems Analysis (IIASA) indicate that ample land resources with potential for crop production are still available, although this result needs to be qualified. Much of the suitable land

not yet in use is concentrated in a few countries in Latin America and sub-Saharan Africa, while many other countries in these regions with growing rural populations are extremely land-scarce. Much of their available land, furthermore, is suitable for growing only a limited range of crops, and not necessarily those for which there is the highest demand. In addition, much of the land not yet in use is affected by chemical or physical constraints, endemic disease or a lack of infrastructure, or else it has important environmental characteristics or value that prevent its use.

**Water resources.** The availability of freshwater resources is similar to the picture of land availability – more than sufficient globally but very unevenly distributed, with an increasing number of countries, or regions within countries, reaching alarming levels of water scarcity. This is often the case in those countries of the Near East and North Africa and South Asia that have few remaining land resources. A mitigating factor could be that there are still many opportunities to increase water-use efficiency.

**Crop yields.** The potential to raise crop yields even with existing technologies seems considerable and, provided the appropriate socio-economic incentives are in place, the difference between agro-ecologically attainable yields and actual yields are bridgeable gaps that could be exploited. Similarly, there is considerable scope for narrowing performance gaps in livestock production. Aquaculture, the fastest growing food production system (6.6 percent annually), offers new opportunities if well managed.

### **Access to food**

Over the coming decades, the projected global economic growth of about 2.9 percent annually is expected to lead to a significant reduction in, or even near elimination of, absolute “economic” poverty in the developing countries (absolute poverty is defined as people living on less than US\$1.25 per day in 2005 prices). Nevertheless, even in 2050, the world will still be far from solving the problem of economic deprivation and malnutrition for significant parts of the population.

Global production increases alone will not be sufficient to ensure food security for everyone, unless governments ensure that access to modern inputs by smallholder farmers and access to food by the needy and vulnerable are significantly improved. Even though the prevalence of chronic undernourishment in developing countries could fall from around 16 percent today to 4.8 percent in 2050, some 370 million persons would still be undernourished in 2050. Of the three developing regions with the highest numbers of undernourished, declines would be most pronounced in East and South Asia, but less so in sub-Saharan Africa.

Based on these projections, the WFS target of hunger reduction may not be reached until well into the 2040s. One major cause of the persistence of hunger is the fact that insufficient food is produced in the countries where three-quarters of the world's poor live.

## Climate change and bioenergy

The assessments summarized above reflect the assumptions that many experts view as “most likely” to hold over the next 40 years. However, they do not reflect the effects of possible changes in climate and bioenergy demand on agricultural production or food security. The uncertainties surrounding the magnitude and spatial characteristics of climate change, the range and efficiency of adaptation possibilities, future developments in fossil fuel markets and policy measures implemented for encouraging bioenergy usage do not allow for the same type of “most likely” outcomes. Instead, they use scenarios regarding climate change intensities and patterns, and bioenergy usage to derive a range of outcomes – without knowing the likelihood of their happening. The results reported by different studies differ significantly because of the differences in the scenarios and the models used. Nevertheless, results suggest that it may be difficult to reach the WFS target, even by 2050.

The measures for addressing the climate change and issues related to increased bioenergy demand are no different from those adopted for current food security issues. However, addressing the longer-term issues stemming from climate change and bioenergy might require additional measures. For example, focusing research on crop breeding and management programmes suited to high temperature and drought conditions, and implementing environmental preservation measures that i) ensure both macroclimate and microclimate effects are considered in all experiments and variety trials; and ii) determine the heat-tolerance limits of currently grown as well as alternative crops and varieties.

## ■ Urbanization and migration: ensuring reliable food supplies for mega-cities

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Urbanization will continue to be one of the key drivers of change in ensuring reliable food supplies in the future. This will not only be a challenge for urban areas. Rural areas will be facing the need to produce more food for growing urban populations while dealing with the movement of populations from rural areas to cities. Ensuring food supplies in the context of rapid urbanization therefore involves rural development, whether directly or indirectly.

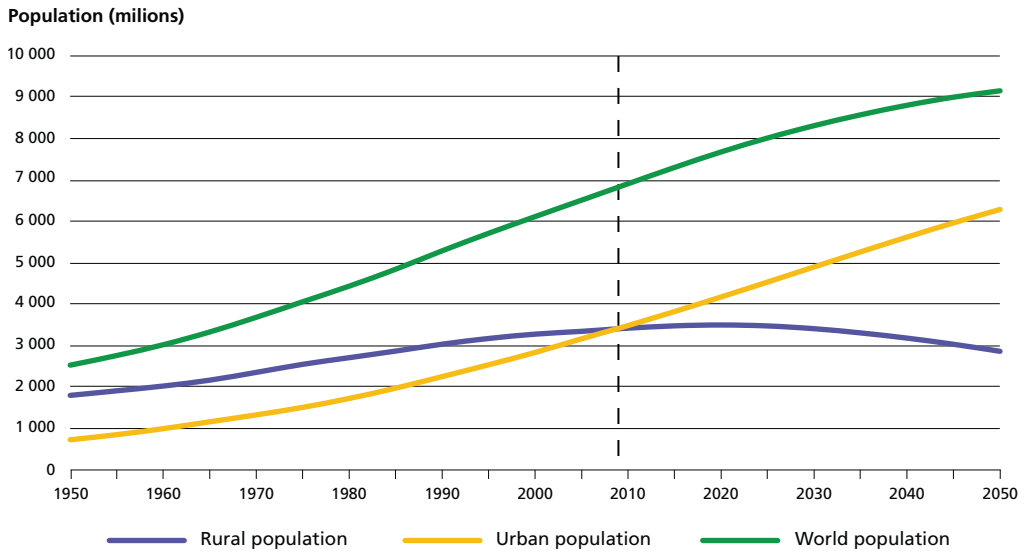
## Urban food security and nutrition

The rapid movement of people from rural to urban environments and natural population growth rates in urban areas (see Figure 4), particularly in the Southern Hemisphere, represent both an opportunity and a threat. It means an opportunity for many poorer rural people to improve the quality of their lives through improved employment, income and access to services. It is a threat, however, if these movements are not supported by appropriate planning. Even though food is available, it is not always accessible by poorer households that may not have enough money to purchase it (UN, 2010a). Poor people in urban areas in developing countries face a daily struggle to feed their families adequately and spend as much as 70 per-



FIGURE 4

## Urban and rural populations of the world, 1950-2050



Source: UN, 2010b.

cent of their total income on food. History shows that food and nutrition insecurity in cities brings risks of social unrest and conflict, as demonstrated in the food crisis riots in cities around the world in 2007 and 2008.

While there are now more people living in cities than ever before, it is important to recognize that large regional disparities do exist. Developed countries are home to 1.2 billion people, some 75 percent of whom reside in cities, while only about 45 percent of the 5.7 billion people living in less developed countries are city dwellers.

The world's urban population is not distributed evenly among cities of different sizes. More than half of the world's 3.4 billion urban dwellers live in cities or towns with fewer than 500 000 inhabitants. These small cities account for about half the urban population in both the more developed and less developed regions. Between 2009 and 2025, small urban centres with fewer than half a million inhabitants are expected to account for 45 percent of the expected increase in the world's urban population (UN, 2010c). Urbanization shows multiple trends in terms of population growth, geographical expansion, socio-economic heterogeneity and management of natural resources.

All cities need to provide housing and shelter, infrastructure, health and education services. In addition, secure, adequate and reliable food supplies are a core requirement in the daily lives of urban populations that rely on markets for their food. Continuing urbanization brings food and nutrition challenges that are magnified by transformations in food demand and markets, rising food prices and the impact of climate change. Ensuring the human right to food for the majority of



the world's population, particularly for the poorest people, involves addressing these issues and keeping them high on the political agenda.

Food and agriculture make a particularly important contribution to local economies. As urban areas develop, they have a critical impact on food security and nutrition and income-generating activities, affecting formal and, especially, informal sectors in terms of food production, processing and marketing. Urbanization also tends to induce growth in the number of middle- and upper-income consumers, whose food choices and dietary patterns tend to be more energy- and GHG emission-intensive. Such changes in demand typically bring major changes in agriculture and in the supply chain (Satterthwaite, Mc Granahan and Tacoli, 2010), ranging from physical infrastructure to associated information technologies.

FAO and its partners support countries and local governments in addressing a broad range of issues that associate urbanization and food security and nutrition. This support encourages countries to adopt a comprehensive approach to ensuring good nutrition for people living in their expanding cities, especially the most vulnerable. Focusing on food and nutrition security and livelihoods in urban and peri-urban areas is a prerequisite for helping poor city dwellers attain a healthier life, and for enabling city authorities and local governments to broaden their strategies for achieving the Millennium Development Goals. Food and agriculture can be a critically important strategic driver for innovative approaches to local development.

### **Food system approach**

A food system includes all processes and infrastructures involved in making good and nutritious food available for a population. While access to good, nutritious and inexpensive food is often taken for granted in urban areas, the urban food system is a complex system that relies on the support and coordination of many actors in public, private and civil society, with local authorities playing a key role in providing a vision and creating a framework of regulations and infrastructures. People, as consumers and citizens, are drivers of this food system. By purchasing their chosen food, they help to guide markets and production. The food system itself can contribute to achieving more balanced diets if supported by a vision and a sound policy framework. Food security and nutrition require political commitment at national and local levels.

More balanced and sustainable diets are directly linked to consumption of more fresh food such as vegetables, dairy products, fish and eggs. Local food production, including urban and peri-urban agriculture for crops and livestock, makes an important contribution to this because the food supply chain effectively connects local producers to food processing and marketing actors. Shorter food chains, with stronger urban-rural linkages, benefit local actors by reducing transportation costs and hazards, and allowing better control of production quality and sanitary conditions. Small-scale activities such as micro-enterprises throughout the food chain may provide women, in particular, with opportunities for generating income and accessing fresh and nutritious food, thereby facilitating their integration into urban economic and social life.

**BOX 4****Urban and peri-urban agriculture in Latin America and the Caribbean**

In Latin America and the Caribbean, FAO provides support in sustainable urban and peri-urban agriculture, increasing its sustainability and efficiency through strengthening simple, appropriate and locally validated technologies. It also supports socio-economic interventions, including supporting community organizations (Bolivia, Peru, Colombia), marketing (Uruguay and Argentina), food security and nutrition (Colombia) and institutional capacity building (Brazil); helps municipalities integrate urban and peri-urban agriculture into municipal management in the context of food security; and develops policy instruments for promotion and support of these initiatives.

Several of these successful programmes have reached substantial numbers of beneficiaries. For example, the Urban Agriculture Programme for Bogotá reached 50 000 families and almost 5 000 urban farmers.

***Food system and climate change.*** A food system approach, with action at local, national and global levels, should be an integral part of a city's strategy in preparing for climate change. At the local level, the practices of farmers and producers can help maintain biodiversity. Adaptation of agricultural production and natural resources management, particularly of land, forests and water, lead to better watershed management which, in turn, can prevent floods and contribute directly to disaster risk management for cities.

***Urban purchasing power.*** Cities play an important role as driver of the local food and agriculture economy. The purchasing power of urban households can support local food systems centred on the city, strengthening and adapting urban-rural linkages (agriculture inputs, natural resources, flows of food, people and money). Urban in-migrants bring with them their cultural backgrounds regarding agriculture and food but may have to adopt new methods of acquiring, preparing and eating food. People living in urban areas often maintain links with rural areas through, for example, ownership of land and houses, or through seasonal participation in planting and harvesting of crops, and these links can be made better with appropriate food-policy frameworks. Urban-rural linkages are critical to ensure balanced programming and planning with a local perspective at rural and urban levels, but in line with a national vision.

**Supporting and managing an urban food system**

Local authorities have an important role in defining and implementing policies at the local level with participation of stakeholders from the public and private sectors, and from civil society organizations and consumer associations. Nutrition education

needs to be promoted, as consumer behaviour is a critical issue in good nutrition. For example, school gardening programmes can be effective tools. Public authorities can help consumers by developing labels and certifications covering food provenance and quality standards.

Land tenure and urban planning policies should take into account agriculture and food. This means reserving space and managing infrastructures for efficient food supply systems (transportation facilities and wholesale markets) and protecting land as necessary for appropriate agricultural production. Maintaining local food production also requires that city development and land-use plans ensure land is preserved for agricultural use. Improving agricultural production in urban and peri-urban areas can be supported by effective planning mechanisms, such as strengthening food-related infrastructure to ensure producers and consumers at the territorial level have efficient access to markets. Encouraging producers to organize themselves into associations is helpful for improving their relationships with local authorities and for facilitating information flows, particularly regarding available land. Public procurement mechanisms, including food purchases for schools and hospitals, can support the food system by involving local agriculture and food producers.

In addition, cities may be vulnerable to natural or human-induced crises that can seriously disrupt the food system. Local governments should develop more resilience by implementing urban policies that integrate food and agricultural issues as well as management of natural resources, including trees, land and water, within a holistic territorial approach. Urban and peri-urban forestry and agriculture development both contribute to the support of environmental and social functions, including mitigating and adapting to climate change, reducing urban heat islands and reducing propensities to floods. Preparedness, disaster risk management and response strategies in these cases need to be further developed. Specific attention should be paid to assisting and targeting internally displaced people in urban areas, especially where these consist of large numbers of people in limited urban and peri-urban areas.

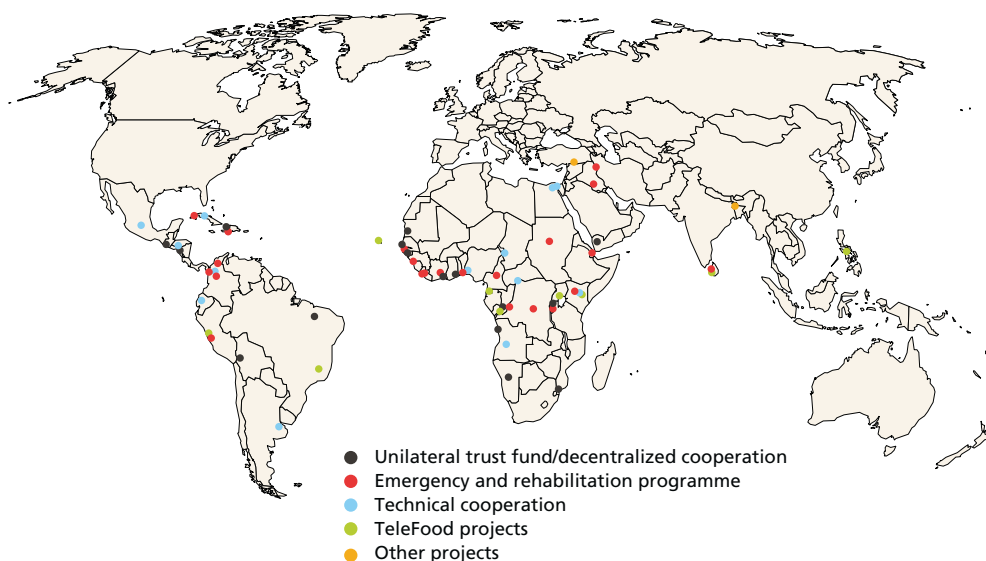
### **Local and rural development for cities, including environmental services**

At local and national levels, FAO supports the development of policies and the implementation of innovative programmes. FAO's multidisciplinary Food for the Cities initiative has implemented projects in a wide range of areas: food supply, nutrition education, school gardens, urban agriculture and horticulture, support to small producers in urban and peri-urban areas, and waste management.

Technical guidance and capacity development tools improve the effectiveness and sustainability of the food system, from production to post-production, with special attention to strengthening livelihoods and increasing food availability, safety and accessibility. FAO provides policy guidance at the municipal and national levels to integrate food and agriculture as part of urban and territorial land-use planning, and in relation to rural-urban linkages. Promoting the protection and

FIGURE 5

## FAO projects within urban and peri-urban areas, 1995-2009



Source: FAO.

improvement of the urban and peri-urban environment is key to i) improving urban resilience and adaptation to natural disasters and climate change; ii) reducing negative impacts on agriculture, water and urban infrastructures; and iii) providing opportunities over the longer term for significant savings in impacts and costs.

Given the major challenges to ensuring food security and nutrition in cities, different actions should be undertaken at the global level. The Food for the Cities initiative draws on FAO's cross-cutting expertise to address food security and nutrition and advise on agricultural responses to urbanization. In addition, FAO has set up dedicated multi-stakeholder platforms for dialogue and action in formulating policy on good governance on food, agriculture and cities. This requires sharing information and good practices that take stock of urban food security and agriculture policies, legal frameworks and programmes that cities and countries around the world have already developed, or are developing, with a view to their systematization and wider dissemination. Guidelines, criteria and indicators for use by policy-makers need to be developed that deal with urban development in relation to agriculture, livestock, aquaculture, land-use planning and forestry, as well as urban food system planning and development.

### ■ Changing patterns of food consumption

The last few decades have seen fundamental changes in food consumption. While staple food consumption and total energy intake have continued to rise, patterns

of food consumption and diets have evolved towards more processed and packaged foods and more meat, eggs, dairy products, sugar, fats and oils. These are energy-dense diets that also are higher in sodium, saturated fats and cholesterol. Such trends are expected to continue until 2050, although at a slower pace because global food consumption will near its saturation point with a slowing of population growth and rising incomes.

However, the increased intake of saturated fats, cholesterol and sugar in diets has meant an increased prevalence of overweight, obesity and related non-communicable diseases. These have significant social costs, in the form of increased health expenditures and lost productivity, and private costs, in the form of deterioration of quality of life. Abandoning traditional diets also can lead to an increase in micronutrient deficiencies, a type of malnutrition that already exists throughout the world in poor households that cannot afford to pay for diversified diets. Meanwhile, on the positive side of new consumption habits, a growing focus on the nutritional and health benefits of fish and fishery products has resulted in a greater demand for seafood worldwide. Global fish consumption has increased gradually but steadily, reaching an all-time high of 17 kg per capita per year in 2007.

### **Current trends**

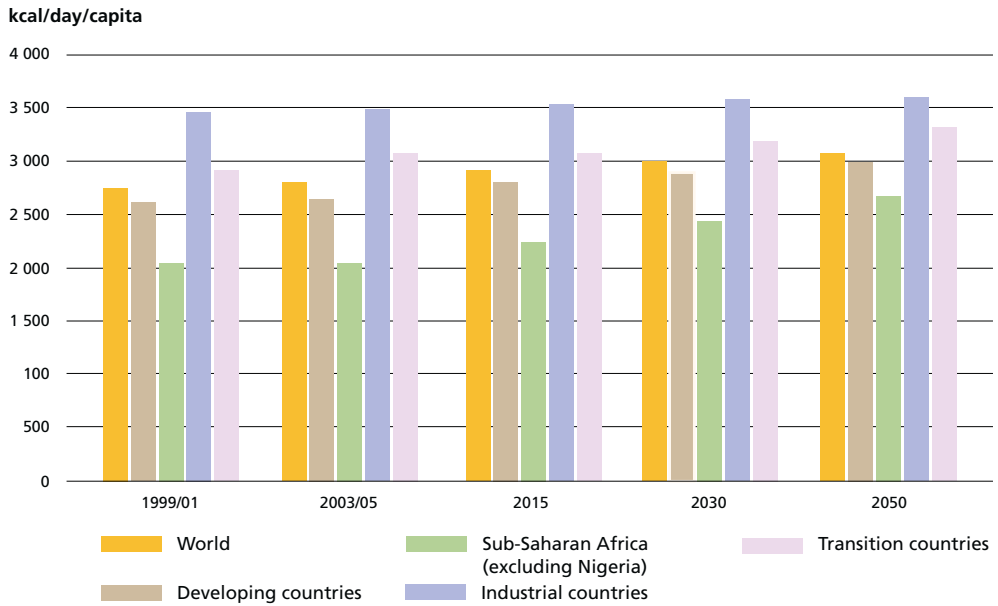
Changes in consumption patterns already have taken place in most developed countries, with many developing countries now undergoing a similar transition, and more countries likely to have similar changes by 2050. Despite the growth in their absolute levels, the relative importance of consumption of carbohydrate-based staples, namely cereals, starchy roots, bananas and plantains (CRBP), has been in pervasive decline in both developed and developing countries. Owing to rapid increases in their consumption, oils and fats, meat and fish, dairy products and, to a lesser extent, sugar together constitute more than half of the total dietary energy supply (DES) in developed countries and almost one-third in developing countries.

These changes have been taking place against a background of increasing per capita food consumption, which is foreseen to continue well into 2050 (Figure 6). There also has been substantial variation in commodity composition during the past few decades (Figure 7). Developed countries have exhibited the lowest variation in consumption patterns, partly due to the fact that food consumption in these countries has reached saturation levels, so there is less substitution among food types. By contrast, developing countries have shown pronounced variability. Among them, countries located in South Asia have experienced the largest changes in dietary patterns, mainly because of a strong increase in consumption of fats and oils and a marked decrease in consumption of pulses. Food consumption in East and Southeast Asia has increased more than in any other region, accompanied by large variation in food patterns such as higher consumption of meat, sugar and oils and fats and rapidly declining consumption of CRBP foodstuffs.

In sub-Saharan Africa, growth in total food consumption has been the lowest of any region, and substitution among major food groups has been limited, with CRBP

FIGURE 6

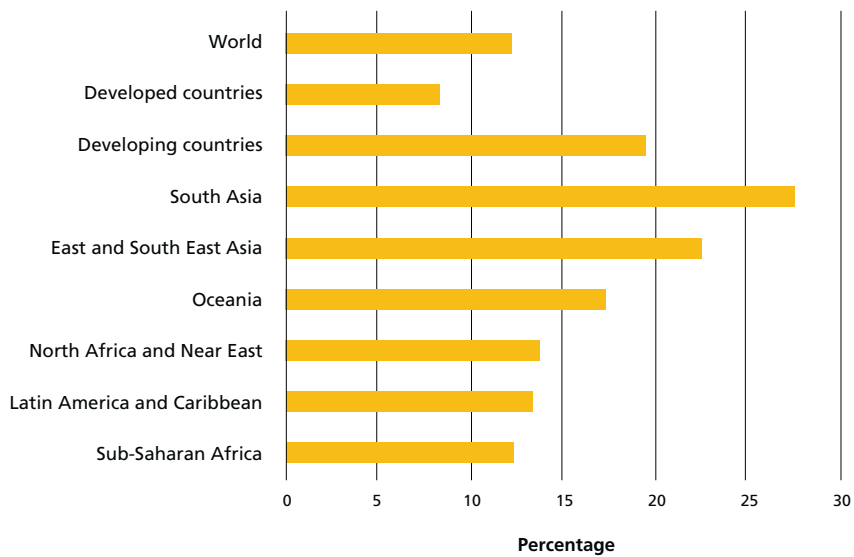
## Per capita food consumption



Source: Alexandratos, 2009.

FIGURE 7

## Variation in dietary patterns, 1961–2001



Source: FAO 2004b. The "variation" in aggregate consumption patterns is measured by the average of the coefficients of variation over the period 1961–2001 for each food item included in the study.

foods continuing to dominate diets. As a result, dietary patterns have been relatively stable over time for the region. Likewise, regional food patterns have varied little in North Africa, the Near East, Oceania, Latin America and the Caribbean, even though they have experienced moderate-to-large growth in overall energy intake. The developing regions also have shifted towards finer grain products, mainly wheat and rice, and away from traditional products such as millet, sorghum, cassava and sweet potato.

It is clear that dietary patterns in most regions have undergone varying degrees of change, but there is a marked relationship between the level of total energy intake and dietary shares of particular food commodities. The developed countries with highest DES have the lowest shares of CRBP and pulses. At the other extreme are the countries of central Africa. They rank highest in terms of undernourishment, with around half the DES intake but double the CRBP and pulses food shares of developed countries. By contrast, all other commodity dietary shares are positively related to the level of DES.

### **Drivers of changes in consumption**

A series of factors has driven these trends, such as rapidly falling real prices for food, at least until the early 1990s; rapid economic growth and increased incomes in many developing countries; population growth; rapid urbanization; emergence of new marketing channels and the proliferation of supermarkets; and freer trade and globalization of the food economy with the arrival of large, transnational food companies and fast-food chains.

Globalization, industrial development, population increase and urbanization have changed patterns of food production and consumption in ways that profoundly affect ecosystems and human diets. The causes and consequences of the dramatic reduction of food diversity and the simplification of diets are complex and not limited to specific cultures, with the overall health of the population, agricultural practices, market conditions and the situation of the environment within a given country all contributing to the complexity.

***Real income and food expenses.*** People in developing countries spend a large proportion of their income on food: a great deal more than the 15 percent estimated for developed countries. Consumers in developed countries are much less responsive to changes in income and food prices than those in developing countries. Irrespective of the level of development, the consumption of staple commodities hardly responds to changes in prices or incomes, while consumption of higher-valued food categories tends to respond much more, especially in low-income countries. Thus, given that consumer reactions to income and price changes differ across food types, rising income or variations in prices will change the composition of food demand and these changes will be more pronounced in developing countries and, at least initially, will tend to improve diets of the poor. By contrast, consumers in developed countries usually make relatively small adjustments between food consumption groups in their overall food intake when they experience changes in income or prices.



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**PHOTO 2**

The proliferation of supermarkets contributes to changing dietary patterns.

***Population growth and urbanization.*** Population growth has been and will be a significant influence in determining the increase in overall demand for food, along with the increase in income growth. For example, the slowing of population growth and the reduced sensitivity of overall food consumption at higher income levels will reduce the pressure on limited resources in the future, plus ageing of populations will lead to further changes in food consumption patterns. On the other hand, urbanization and changes in real income have been among the most important factors changing the structure of food demand and consumption. While most developed countries have largely completed this transition, it is still an ongoing process in many developing countries. Apart from the fact that urban incomes are, on average, much higher than rural incomes, rural and urban diets differ due to the nature of urban lifestyles and changes in the way food is processed, marketed and prepared in urban areas.

***Urban lifestyles and processing and marketing of food.*** Urban lifestyles, on average, are more sedentary than rural ones, expending less energy and thus less reliant on energy-providing staples. Moreover, changing work habits and increased participation of women in the workforce have tended to reduce time devoted to the preparation of food and increase frequency of eating out. New and improved marketing and distribution infrastructure, proliferation of supermarkets with their sophisticated food handling systems, and better roads and ports have improved access by foreign suppliers, increased the importance of imports in overall food supply, and promoted globalization of dietary patterns. These tendencies have increased the consumption of processed foods that contain more total fat, trans-fatty acids, sugar and sodium, and less dietary fibre, minerals and vitamins.

### **Health effects of new consumption patterns**

Within limits, the shift towards higher meat and milk consumption reflects a desirable nutritional goal for many developing countries. Both the increased quantity and quality of protein and access to essential minerals and vitamins in the diet benefit infants and children by promoting steady growth in the first years of life.



Similarly, improved bio-availability of iron is good for women who are at increased risk of anaemia in their reproductive years. However, as intake levels rise further, these benefits decline rapidly. Once intake reaches adequate levels, there is no good argument for continued increases. On the contrary, high intakes are associated with considerable risks and detrimental health effects, including increased incidence of some cancers and cardiovascular diseases.

***Addressing negative impacts in developing countries.*** The adverse impacts of rapid changes in consumption patterns, or “nutrition transition”, are likely to be compounded by a number of factors that are specific to developing countries. This may not only mean that the nutrition transition proceeds faster in developing countries, but also that its adverse impacts are likely to be felt more strongly there. For example, those whose mothers were undernourished during pregnancy or who were stunted as children have a predisposition to obesity in later life. In addition, many developing countries lack adequate health promotion and healthcare systems that could help prevent and cope with the adverse impacts. The measures necessary to address these challenges are complex and varied. The first involves fighting hunger today in a way that minimizes the predisposition of infants and children to develop obesity and non-communicable diseases later in life.

- *Focus on pre-natal and infant nutrition.* Maternal and child nutrition programmes, such as the USA-backed 1 000 Days Campaign, are designed to ensure infants receive proper nutrition during their early years, and also help improve nutrition during pregnancy and pre-pregnancy. By helping curb a likely obesity epidemic, these programmes will yield an extra return in the future – over and above their immediate anti-hunger dividend. Given the speed with which consumption patterns are changing, and the higher susceptibility of developing country consumers to obesity and non-communicable diseases, there is an urgent need to design and devise policy measures that help avoid adverse nutritional outcomes in developing countries.
- *Conserving biodiversity and traditional foods.* Agricultural biodiversity has an increasingly acknowledged role to play in moderating nutritional problems. The food systems of indigenous peoples demonstrate the importance of a diversified diet based on local plant and animal species and traditional food for health and well-being. In most cases, the increase in consumption of processed and commercial food items over time decreases diet quality. Countries, communities or cultures that maintain their own traditional food systems are better able to conserve local food specialties with a corresponding diversity of crops and animal breeds. They are also more likely to show a lower prevalence of diet-related diseases.

Several policies have been proposed to deal with the adverse nutritional outcomes. Nutrition education with emphasis on traditional food and preparation might also help.

## Conclusion

Global population is forecast to reach 9.2 billion by 2050. That means 2.3 billion more mouths to feed from the same resource base we have today, and against a backdrop of rising numbers of hungry and malnourished. FAO, with its mandate to ensure global food security, maintains its focus on the agriculture sector as the driver of economic growth in the developing world but also as the sector that has the potential to support the poorest and most food-insecure of the world's population.

The central issues of population, food demand and agricultural production include the effects of increasing urbanization which not only means more people must purchase their food instead of growing it, it also means that increased production will have to be accomplished with a smaller rural labour force. Specifically, looking towards 2050:

- overall food production will need to increase by 70 percent and production in developing countries will need to double; and
- cereal production will need to increase from today's 1.8 billion tonnes to 3 billion tonnes.

This can be done, but it will require the adoption of more efficient and sustainable production methods that at once can adapt to and contribute to mitigating climate change. In a context of urbanization, FAO advocates a food system approach that ensures urban and peri-urban food quality and safety through shorter food chains, strong urban-rural linkages and sound management of natural resources.



## CHAPTER 2

# Pressures on natural resources and the environment

In the 21st century the world faces a stark contrast between the availability of natural resources and the demands of billions of humans who require those resources for their survival. There was a time when natural resources seemed infinite. Yet, as the world's population has increased, the availability of natural resources that support human life – food, freshwater, quality soil, energy and biodiversity – have decreased proportionately, and existing stocks are being increasingly polluted, degraded and depleted.

With an increasing percentage of the Earth's surface dedicated to cropland and the fact that a full 70 percent of abstracted freshwater is used by agriculture, there is no question that agriculture needs to be at the centre of any discussion on natural resource management and global environmental objectives.

The paradox of food insecurity and hunger is that at the global level, there is sufficient production to provide nutritionally satisfactory food to everyone. Yet one in seven people in the world suffers constant hunger. In spite of the global adequacy of food supplies, people in countries with persistent food insecurity problems lack access to the global plenty. In many countries, food security depends on the performance of local agricultural production.

Investing in the development of agriculture will be particularly effective in those countries with high population growth. However, the natural resource base of some of these countries may not be sufficient to make significant progress. Therefore, serious thought needs to be given to supplementing efforts to develop agriculture with interventions in other sectors that are not affected by agricultural resource constraints.

## Land and water resources

The availability of good quality land and water resources, together with an enabling socio-economic and institutional environment, is essential for food security. The range of land uses adopted for human needs is primarily determined by demographic and socio-economic drivers, cultural practices and political factors, such as land tenure systems, markets, institutions and agricultural policies. Environmental conditions are also a determining factor, including climate, topography and soil characteristics.

## Land resources

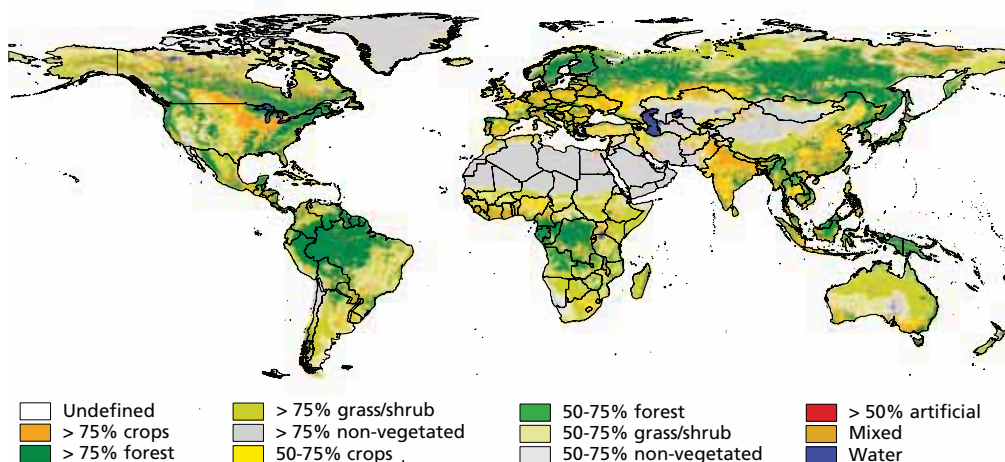
According to FAO, the global land mass comprises about 13.3 billion ha, of which about 12 percent is currently in use for cultivation of agricultural crops, 31 percent is under forest and 40 percent comprises grasslands, woodlands, wetlands and other ecosystems. Driven by human needs and technological capabilities, substantial shifts in land use have taken place in the last decades. During the last 50 years, forest ecosystems have declined by about 15 percent while the area of pasture and cultivated land has increased.

The current 1.6 billion ha of cultivated land represent the better and more productive part of global land resources. Locally, owing to population pressure and lack of prime or good-quality options, less suitable and marginal lands have been converted to cropland. Through unsustainable use, high-quality agricultural land in some areas has been degraded as a result of human-induced water and wind erosion, nutrient mining, topsoil compaction, soil pollution and salinization caused by improper irrigation and drainage practices. Once degraded, the land is frequently abandoned and left as marginal grassland and woodland, with only a part of it developing into secondary forest ecosystems.

Nearly one-third of the world's arable land has been lost through erosion during the last 40 to 50 years, with losses continuing at a rate of more than 10 million ha per year. This degraded land has been replaced by converting mainly prime and good-quality agricultural land resources – namely those available in grassland, woodland and forest ecosystems – into cultivated land.

FIGURE 8

### Dominant land use and cover



Source: FAO, 2011a.

### **Soil and terrain constraints**

In developed countries, about 60 percent of cultivated soils, some 366 million ha, are assessed as having only minor or no soil and terrain constraints, with soil nutrient availability reported to be the most limiting factor for the other 40 percent. In less developed countries, 42 percent of cultivated soils, about 410 million ha, have only minor or no constraints, while nutrient availability is the predominant cause of soil constraints for the remaining 58 percent.

Soil nutrient availability is by far the most prevalent soil limitation in most regions, but particularly in the tropics and in large parts of central Africa and central South America. Although the natural fertility status of soils may have deteriorated over time through nutrient mining, if correct soil management and appropriate fallowing are adopted, the natural status might be restored over time. Under high-input farming conditions, low natural nutrient availability can be alleviated by mineral fertilizer application, provided the soil has an adequate nutrient retention capacity.

Low nutrient retention capacities are found in southern Africa, the Amazon area, central Asia and northern Europe. In those areas, increased use of fertilizers alone may prove less effective for increasing crop yields.

### **Vulnerable land-use areas and systems at risk**

The capacity of some local production systems to achieve the higher rates of agricultural intensification required to meet projected food demand is constrained by multiple factors: increasing pressures on land and water resources from population growth, changes in dietary habits, climate change, biofuel production, land degradation, and water pollution and depletion due to unsustainable practices and competition for ecosystem services (e.g. the diversion of water supplies for industry and urban users).

The production systems where these conditions exist or are anticipated constitute “systems at risk”. They warrant appropriate remedial action that entails: i) technical options to promote sustainable intensification and to reduce risks that are acceptable for either rainfed or irrigated conditions; and ii) the creation of enabling conditions, including the elimination of institutional mechanisms that reinforce inefficiency, social inequity and the degradation of resources. Distortions in the incentives framework need to be removed, land tenure systems and access to resources need to be improved, and planning and management as well as transboundary and international cooperation established. Efforts to facilitate knowledge exchange and appropriate adaptive research are also crucial.

### **Mitigation and management measures**

Rather than drastically changing land-use practices, which may only be required in a limited number of areas, the increased environmental risks can be managed by mainstreaming adaptation and mitigation into core development work and investments in:

- capacity development in land-use planning and adapted, sustainable land-use management;
- infrastructure development to reduce damage and protect assets;
- weather stations and climate monitoring and information services;
- technology transfer combined with local innovation to ease land-use transition and reduce resource degrading practices in cropping, pastoral and forest systems and aquaculture;
- early warning and emergency response systems based on sound vulnerability assessments;
- innovative risk financing mechanisms and insurance schemes to spread residual risks;
- payments for environmental services to provide incentives for the required changes towards better land and water management, reduced greenhouse gas emissions, enhanced carbon sequestration in plants and soils and biodiversity conservation;
- more efficient energy use (no-till systems, use of sustainable fuel), including a focus on use of wastes and residues – primarily from agro-processing units, integrated food energy systems and biofuel projects that set aside land to meet local food needs.

In situations where drastic changes in land-use patterns are necessary, access to surface water and groundwater needs to be factored in, and this has implications for both intensive agriculture and animal production. In addition, rights for land and water use now tend to be administered separately, meaning that before any comprehensive reform of land-use planning is enacted, the interface between these systems must be fully appreciated. Critical considerations include recognition of customary rights, transparency and stability of use rights, and the impact of land-use planning on national and international river basin water balances and water scarcity.

There also is a pressing need to invest in and improve capacity for land-use planning at national, regional and local levels. Improved planning can improve resource allocations, increase investments and local action-oriented planning and thereby support the transition to more sustainable and productive land-use systems and, at the same time, facilitate adaptation to population growth, migration, climate change and economic conditions. In Mozambique, experiences in land management and negotiated territorial planning have been recognized by the private sector, including smallholders, as the main engine for economic development. This has encouraged private investment in land development, within the framework of a negotiation process involving all stakeholders. Such investments have the potential to stimulate production, address problems related to soaring food prices and increases in global hunger, reduce rural-urban migration and respond to negative effects of climate change.

### **Sustainable land management**

To meet the challenges described in earlier sections, namely the rapidly increasing demand for food and energy in the face of land scarcity and associated risks of

conflicts over natural resources, uncontrollable migration, ecosystem and environmental degradation, and the need for mitigation of and adaptation to climate change, a paradigm shift and new approach to governance of land resources is needed. Such a new governance system must be based on the principles of what is referred to as sustainable land management (SLM).

SLM comprises a series of technical and management practices based on intensive agro-ecology that could be used as a base for an emerging “green agriculture”. Technically, these concern the integration and wide application of the following practices:

- crop management techniques – including conservation agriculture, use of improved seeds and germplasm adapted to local land uses and ecosystems, integrated pest management, mulching and residue management;
- pasture and rangeland improvement methods – including planned grazing processes, area exclusion for grazing recovery or enrichment planting, and improved breeding;
- forest improvement – including agroforestry, planting, natural regeneration, shelterbelts and fire protection;
- improved soil management – including retention of crop residues and soil cover, addition of organic matter or soil carbon with compost, manure and green manure (cover crops), integrated nutrient management with wise use of mineral fertilizers, and zero or reduced tillage;
- improved rainwater management – including contour ridges and tied ridges and natural vegetative strips.

The underlying principle of SLM is that it should be managed by the users according to social approaches. It should entail community-based participatory planning and technology development, which builds on rural people’s skills and capabilities to plan, develop and implement the required practices. In addition, it should ensure the participation of marginalized groups and involve landscape, territorial and participative land-use planning. It also calls for people-centred learning approaches, using participatory adult learning methods in which land users learn about integrated management of crop, livestock, fishery and forest production, land degradation problems and input supply and marketing constraints.

People-centred approaches enable those who are actually involved to identify ways to address issues, test and monitor different practices, and review and share their findings. Farmer Field Schools, an approach supported by FAO, follows this method and has been very successful working with farmers in their fields to raise awareness of environmental issues and also to improve production.

FAO has also designed and implemented policies, programmes and projects on land and natural resources management to enable member countries to produce more food of better quality while using less land and water per unit of output; providing rural people with resources and opportunities to live a healthy and productive life; applying clean technologies that ensure environmental sustainability; and contributing productively to local and national social and economic development.



## Land tenure

Providing adequate rights of access to land and other natural resources and the secure tenure of those rights is essential to fostering sustainable and progressive agricultural development. Secure land tenure empowers and enables development and is a valuable safety net as a source of shelter, food and income, especially in times of hardship, and leads to greater environmental security. Farmers are quite naturally more inclined to invest in improving their land if they have secure tenure and can benefit from their investments. Secure tenure can include community user rights, leasehold and tenancy arrangements to private land titles. Without secure tenure and access rights to water and forest resources, the alternative is for farmers to exploit marginal land, abandoning it when it becomes unproductive, which implies either migrating to search for employment in urban areas or, where possible, moving on to clear forests and other fragile land areas that are available. With increasing population pressure, fallow periods shorten and the land is again exploited before it has time to recover through natural regeneration processes.

Resources and ecosystem degradation is exacerbated in marginal or fragile lands where natural recovery tends to be longer and fails to regenerate former levels of productivity. An FAO-led initiative underway to develop voluntary guidelines for responsible governance of land tenure is explained in Chapter 4.

FIGURE 9

### Evolution of areas equipped for irrigation, 1961-2007

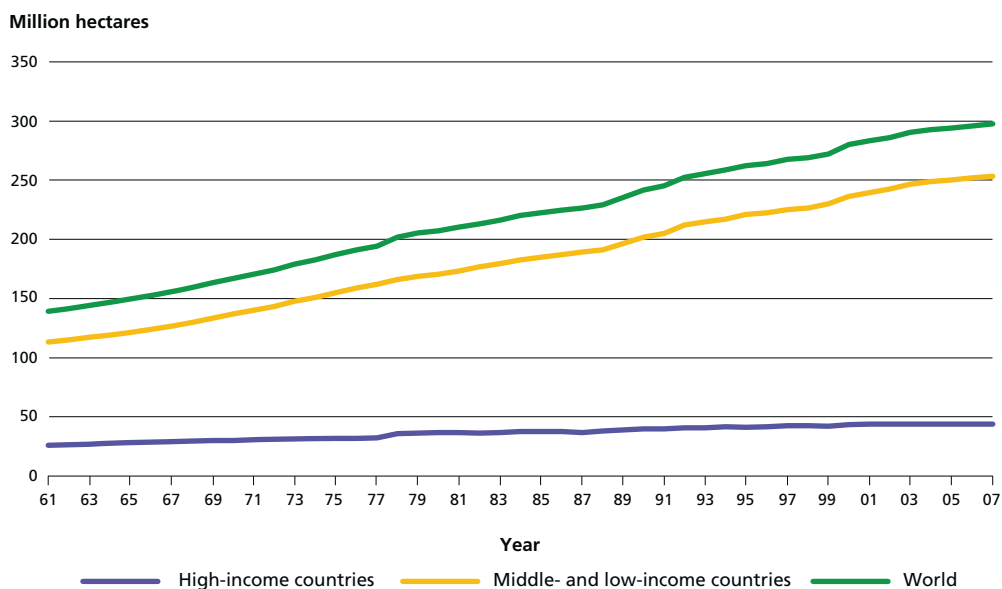
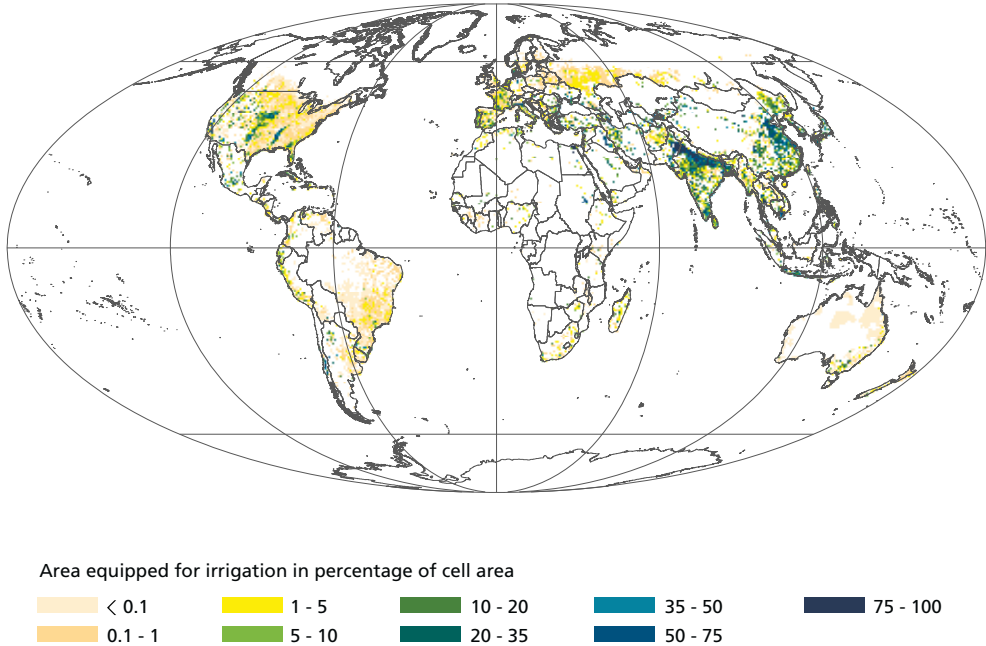


FIGURE 10

## Part of total land area equipped for irrigation



Source: Institute of Physical Geography, University of Frankfurt and FAO, 2011c.

## ■ Water resources

The management and control of freshwater, mainly through irrigation, to produce crops, water livestock and manage aquaculture have proved essential to livelihoods and economic development. Without that control and management of freshwater resources, the world's agricultural systems would not have been able to meet unrelenting increases in demand for food and fibre. The land simply would not have been available to meet such demand under rainfed conditions.

### Irrigation and implications of growing water scarcity

Today, rainfed agriculture continues to provide the base-load of cereal and fodder crops and currently accounts for 60 percent of global agricultural production. Where climate has been variable and the pressures of human demand have risen, however, the volatility of rainfed agriculture has become untenable. Intensification of production through water control has been necessary to make up the 40 percent shortfall and provide a buffer against the volatility inherent in rainfed production.

Globally, the area of land under cultivation increased from 1.4 billion ha in 1961 to 1.6 billion ha in 2010, a net increase of about 14 percent. All of this increase is attributable to irrigated cropping. In fact, land under rainfed systems has shown a

very slight decline, while the irrigated area more than doubled from 140 million in 1961 to 300 million ha in 2009. In addition, thanks to increased productivity, the area needed to feed one person has been reduced significantly.

In the years ahead, the trend towards higher consumption of animal protein will have consequences not only for more intensive production of fodder crops, but also for watering livestock, which will become even more critical considering the prospect of more variable weather patterns. Controlling water resources will enable agricultural systems to be more responsive to these changing demands. Applying knowledge, technology and the strategic targeting of investment in water control will be a key to closing the gaps between supply and demand. It is thus imperative to pay attention to the critical role of water in poverty alleviation, food security and economic growth.

The growth in areas served by irrigation has been spectacular. It would not have occurred without investment in water infrastructure, which includes water storage, conveyance, energy supplies, roads and marketing, and a corresponding response from farmers who invested private capital in irrigation systems. Growth in the number of private tubewells that provide on-demand, just-in-time water services continues to eclipse growth in areas serviced by the control of rivers and lakes. A recent FAO inventory of country data found that almost 40 percent of the global area equipped for irrigation relies on groundwater as an exclusive or supplementary source of water.

### **Impacts of irrigation on poverty and food security**

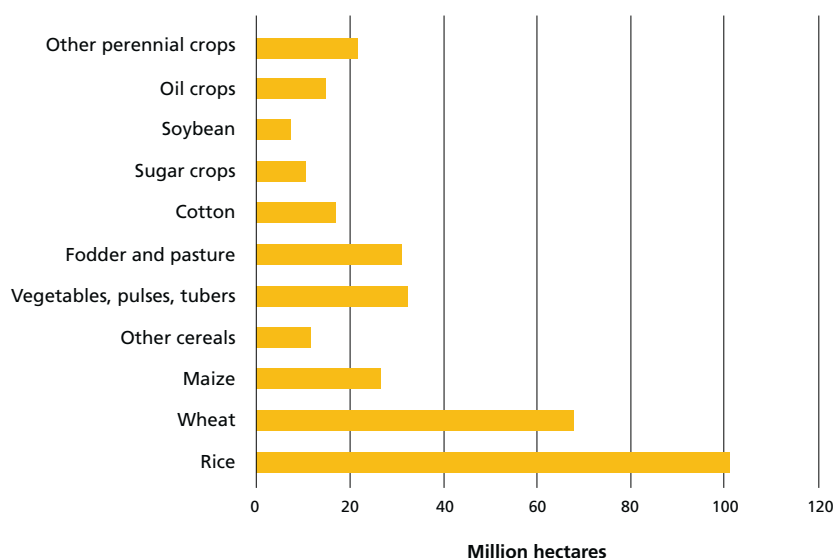
Where vibrant markets for irrigated production are present, farm incomes and food security have been transformed. The consistent support by FAO and the International Fund for Agricultural Development (IFAD) to smallholder irrigation has become an integral part of national food security programmes, where the economics of irrigation technology and markets have converged – although this has not been without risks.

Irrigation reduces poverty through increased food output, higher employment, and higher real incomes. It also supports the poor through a multiplier effect which drives an increase in non-farm rural output and employment as the level of rural spending rises. Irrigation also contributes to risk reduction by reducing variability in output, employment and income, allowing for more productive investments and lessening the periodic liquidation of capital, such as livestock, during times of crisis.

However, despite these poverty-reducing benefits of irrigation, many irrigated systems can have negative impacts on the poor in situations where adverse social, health and environmental costs have not been mitigated. It must be noted that irrigation can only be effective in reducing poverty if the schemes are well managed – poor irrigation performance is associated with higher poverty levels. The incidence of poverty is also generally correlated with an individual's position within a scheme – tail-enders are typically poor – and with inequitable land distribution. Irrigation's positive impact on poverty is highest where landholdings – and therefore water – are equitably distributed.

FIGURE 11

## Global distribution of harvested irrigated crops, 2009



Source: FAO, 2011c.

As Figure 11 illustrates, irrigation has been especially important for countries with high population densities, particularly Asia. What is more perplexing is why the uptake of intensive agriculture has not been more pronounced in parts of the world where land and water resource endowments appear adequate. Sub-Saharan Africa is a case in point – only 4 percent of its cultivated area is equipped for irrigation.

### Environmental costs of growing water scarcity

The expansion of irrigated areas has come at a cost. Globally, 2 710 km<sup>3</sup> per year, or 70 percent of the total water withdrawn from rivers and aquifers, is used by agriculture, compared with 19 percent by industry and 11 percent by the municipal sector. Clearly, agriculture has a lot to account for.

The reduction of river flows, loss of aquatic habitat, salinization of land and depletion and degradation of aquifers are common indicators of the environmental pressure irrigation places on natural resources. Countries have developed their water resources extensively over the past 50 years through a combination of policies and investments that have increased supply and stimulated demand. Some 45 percent of the world's rural population lives in river basins that are categorized as physically water scarce with respect to overall demand.

Salinity associated with poor drainage, or waterlogging, affects 11 percent of the irrigated land (34 million ha), mostly in arid areas. Pakistan, China, the USA and India represent more than 60 percent of the total (21 million ha). Less evident, but equally pernicious, are the impacts related to accumulation of fertilizer and pesticides

in the environment, that bring with them risks to human health and can reduce productive wetland biodiversity and aquaculture. The concentration of these agrochemicals in the environment can be attributed to irrigated agriculture, where the incentives to sustain reliable levels of production are clearly much higher. FAO's integrated pest management (IPM) programme has proved effective in reducing pesticide use in many irrigated areas, but more needs to be done to reduce this accumulation and halt the impact on human health and environmental integrity.

### **Role of water in integrated natural resources management**

Linking land and water systems to meet an increasingly sophisticated set of competing demands has become a well-accepted global priority. Integrated river basin development has been embraced as an ideal tool for reconciling these demands since the middle of the 20th century. But the practice has been overtaken by the sheer pace of economic development and the expansion of urban, industrial and agricultural land use in river basins. Ten years into the 21st century, a return to integration should be much better informed. Advanced knowledge of the hydrological cycle, improved agricultural practices and new tools for mitigating the impacts of chemical pollutants and managing wastewater now offer a set of knowledge-rich solutions for reducing environmental impact. Taken together with new institutional approaches to resource management that are much more inclusive of water users, there is now scope for achieving positive change across the key land and water systems that furnish the global food supply. Conservation of forests and wetlands, the natural regulators of the hydrological cycle, are particularly important in this context.

The increasing pressure and demand on water resources for agricultural production requires an integrated and ecosystem approach to water resources management. Integrated and collaborative watershed management is an appropriate approach since it addresses all aspects of local livelihoods, including agriculture, pasture, forestry and hydrology and aims at ensuring sustainable management of natural resources. Forests are particularly important as they play a crucial role in the hydrological cycle, capturing and storing water, preventing soil erosion, and serving as natural water purification systems. Forests influence the amount of water available, regulate surface and groundwater flows and ensure high water quality. Moreover, forests and trees contribute to the reduction of water-related risks such as landslides, local floods and droughts, and help prevent desertification and salinization. Forested watersheds and wetlands supply three-quarters of the world's accessible fresh water for domestic, agricultural, industrial and ecological needs.

### **Water and agricultural intensification**

In the years ahead, the largest contribution to increased agricultural output is likely to come from intensification of production in existing irrigated areas. Increased water productivity and higher cropping intensities will only be achieved through improved flexibility, reliability and timing of water service, and more efficient water use, which will require investments in both modernization of irrigation infrastructure and institutional capacity.

The availability of water for agriculture will become a growing problem in areas that use a high proportion of their water resources and expose their systems to high levels of stress. Climate change, which is expected to exacerbate these stresses, plus the continuing risks of pollution, salinization and waterlogging and their potential impacts on downstream water-related ecosystems, will require careful management. Key food producers depend on groundwater, meaning declining aquifer levels may create a risk to regional food production, with possible implications on food prices at the global level.

The rate of expansion of land under irrigation already is slowing substantially. FAO has projected that the global area equipped for irrigation may increase at a relatively modest rate to reach 322 million ha in 2050 and 324 million ha in 2080. This compares with around 302 million ha for the baseline period of 2005/07. Most of this expansion is projected to take place in developing countries. This would represent an increase of around 7 percent, or 0.1 percent per year, much slower than in recent years, considering that between 1961 and 2009, irrigated area grew by 1.6 percent per year globally, and by more than 2 percent per year in least developed countries (LDCs).

The trend in water use by agriculture is also slowing as the performance of irrigation systems and agronomy improve, raising the productivity of both irrigated land and water. But rapid transitions from rural to urban settings are further concentrating patterns of demand. Since agriculture will continue to be the main water user, improved agricultural water use in irrigated agriculture will have a direct impact on local and regional water demands. Allocations taking raw water away from agriculture to other higher utility uses – municipal supplies, environmental requirements and hydropower generation – are already taking place, but there is still scope for these allocations to be optimized in economic and environmental terms. Agriculture also will need to benefit from the progressive increase in use of treated wastewater from the urban sector.

Improved agricultural water use has resulted in higher crop yields and cropping intensities, but there is still considerable scope for technical efficiency gains at all levels of agricultural production. Technical improvements are anticipated in two key areas.

- *On-farm irrigation management.* Water deliveries will need to be better tailored to crop needs and soil conditions. Reductions of water losses through modernized conveyance, better field application (e.g. drip and sprinkler), enhanced soil moisture management, and reduced runoff and evaporation from bare soil will all enhance on-farm irrigation efficiency. In addition, local water reuse will further increase efficient utilization of the resource.
- *Irrigation scheme water management.* In order to improve utilization of the water resource at system level, two main strategies need to be accelerated: first, the systemic modernization of irrigation schemes to suit farmer demands which will involve managerial and institutional changes where necessary; and second, the transfer of responsibility for management of the irrigation system

TABLE 1

Area equipped for irrigation, projected to 2050

CONTINENT REGIONS	Area equipped for irrigation				
	Area <i>Million hectares</i>			Annual growth <i>Percentage</i>	
	1961	2009	2050	1961-2009	2009-2050
<b>AFRICA</b>	<b>7.4</b>	<b>13.6</b>	<b>17</b>	<b>1.3</b>	<b>0.5</b>
Northern Africa	3.9	6.4	7.6	1	0.4
Sub-Saharan Africa	3.5	7.2	9.4	1.5	0.6
<b>AMERICAS</b>	<b>22.6</b>	<b>48.9</b>	<b>46.5</b>	<b>1.6</b>	<b>-0.1</b>
Northern America	17.4	35.5	30	1.5	-0.4
Central America and Caribbean	0.6	1.9	2.4	2.5	0.5
Southern America	4.7	11.6	14.1	1.9	0.5
<b>ASIA</b>	<b>95.6</b>	<b>211.8</b>	<b>227.6</b>	<b>1.7</b>	<b>0.2</b>
Western Asia	9.6	23.6	26.9	1.9	0.3
Central Asia	7.2	14.7	15	1.5	0
South Asia	36.3	85.1	85.6	1.8	0
East Asia	34.5	67.6	76.2	1.4	0.3
Southeast Asia	8	20.8	23.9	2	0.3
<b>EUROPE</b>	<b>12.3</b>	<b>22.7</b>	<b>24.6</b>	<b>1.3</b>	<b>0.2</b>
Western and Central Europe	8.7	17.8	17.4	1.5	0
Eastern Europe and Russian Federation	3.6	4.9	7.2	0.6	0.9
<b>OCEANIA</b>	<b>1.1</b>	<b>4</b>	<b>2.8</b>	<b>2.7</b>	<b>-0.8</b>
Australia and New Zealand	1.1	4	2.8	2.7	-0.8
Pacific Islands	0.001	0.004	–	2.9	–
<b>WORLD</b>	<b>139</b>	<b>300.9</b>	<b>318.4</b>	<b>1.6</b>	<b>0.1</b>
High-income countries	26.7	54	45.1	1.5	-0.4
Middle-income countries	66.6	137.9	159.4	1.5	0.4
Low-income countries	45.8	108.9	113.8	1.8	0.1
<b>Low-income food-deficit countries</b>	<b>82.5</b>	<b>187.6</b>	<b>201.9</b>	<b>1.7</b>	<b>0.2</b>
<b>Least-developed countries</b>	<b>6.1</b>	<b>17.5</b>	<b>18.4</b>	<b>2.2</b>	<b>0.1</b>

Source: FAO, 2011b, 2011c.

from government agencies to non-governmental agencies, such as water users' associations or private enterprises.

### Promoting responsible use of scarce water resources

Promoting responsible water use for agricultural production, a key feature of FAO's current water programme, will need to be accelerated if food production is to be maintained and the benefits of irrigated production equitably distributed.

The role of governments will remain fundamental in setting directions for agricultural water management, but governments cannot do it alone. The private sector is beginning to recognize its role in water management, and business leaders are mobilizing through initiatives such as the CEO Water Mandate, a public-

private initiative of the UN Global Compact designed to assist companies in the development, implementation and disclosure of water sustainability policies and practices. But the potential for greater and more concerted action remains considerable.

Improved agricultural water management is fundamental to any water reform. In many local water balances, fishers and aquaculturists, pastoralists and farmers are the prime stakeholders in planning and implementing sustainable land and water management. Therefore solutions have to include the incentives, facilitation and empowerment needed at the local level, such as secure land tenure and water use rights, rural credit and finance and access to technology and good practices. The involvement of community and farmers' organizations is also essential.

There is a pressing need to transform land and water institutions. While our current institutions have helped drive land and water management to unprecedented levels of productivity, many of the problems of degradation of land, water and biodiversity have resulted from institutions not keeping up with a rapidly changing world.

It also will be critical to ensure that intensifying agriculture through water control is sustainable. At the outset, the basic water allocations to agriculture have to be negotiated with competing users and neighbouring countries. This will have to be done transparently with the establishment of clear water-accounting procedures in river basins and aquifer planning frameworks that establish priorities for water uses and environmental standards.

Finally, it will be essential to embed agricultural water resources management into the broader context of natural resources management, livelihood improvement and biodiversity conservation.

## ■ Forests

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Humans place high expectations on the world's forests, which provide a range of wood and non-wood forest products, including timber, fuelwood and charcoal, paper, food medicine and fodder. At the same time, they provide vital services at the global and local levels, including biological diversity, mitigation of and adaptation to climate change, soil and water conservation and provision of employment and livelihoods. Yet our forests face growing pressure from a number of natural and human-induced threats.

The world's forest area was estimated to be slightly more than 4 billion ha in 2010, which represents 31 percent of global land area and an average of 0.6 ha of forest per capita. However, forest area is unevenly distributed. The five most forest-rich countries – the Russian Federation, Brazil, Canada, the USA and China – account for more than half (53 percent) of the global forest area, while 64 countries with a combined population of 2 billion have forest on no more than 10 percent of their land area, and ten have no forests at all. These include a number of fairly large countries in arid zones, as well as many small island developing states (SIDS) and dependent territories.



## Forests and food security

Forests contribute to each element of the food, fuel and financial (triple F) crisis, particularly to the aspects affecting the rural poor who depend on forests for fuel-wood, for a wide variety of food products and as a source of income. FAO's work over the last 20 years has clearly demonstrated the contribution that forests make to food security in Africa. This is also true in the case of Asia and Latin America, particularly for the poorest of the poor. Likewise, much of the cooking fuel in the developing world still comes from wood – either as charcoal or firewood. Inadequate supplies mean poorly cooked or uncooked food, or food that is expensive to cook. While this problem continues to threaten food security, it also places pressure on remaining natural forests. When the rural poor collect wood, branches and leaves for fuel instead of leaving them on the ground to decompose and fertilize the soil, the soil becomes impoverished and less useful for a growing population.

Forests contribute substantially to livelihoods in many ways. For example, globally, they contributed some US\$468 billion in global gross value added in 2006, including a substantial amount in rural areas where few alternative economic activities exist.

## Forest resources under threat

**Deforestation.** FAO's 2010 Global Forest Resources Assessment estimated that about 13 million ha of forest were converted to other uses – largely agriculture – or lost through natural causes each year of the 2000–2010 period. This compares with a revised figure of 16 million ha per year in the 1990s. Both Brazil and Indonesia, which had the highest net loss of forest in the 1990s, have significantly reduced their rate of forest loss, while in Australia, severe drought and forest fires have exacerbated the loss of forest since 2000.

At the same time, afforestation and natural expansion of forests in some countries have significantly reduced the net loss of forest area at the global level. The global net change in forest area in the period 2000–2010 is estimated to be a loss of 5.2 million ha per year, an area about the size of Costa Rica. This substantial reduction, 37 percent less than the 8.3 million ha annual net loss in the period 1990–2000, is due to both a decrease in the deforestation rate and an increase in the area of new forest established through planting, seeding or natural expansion of existing forests.

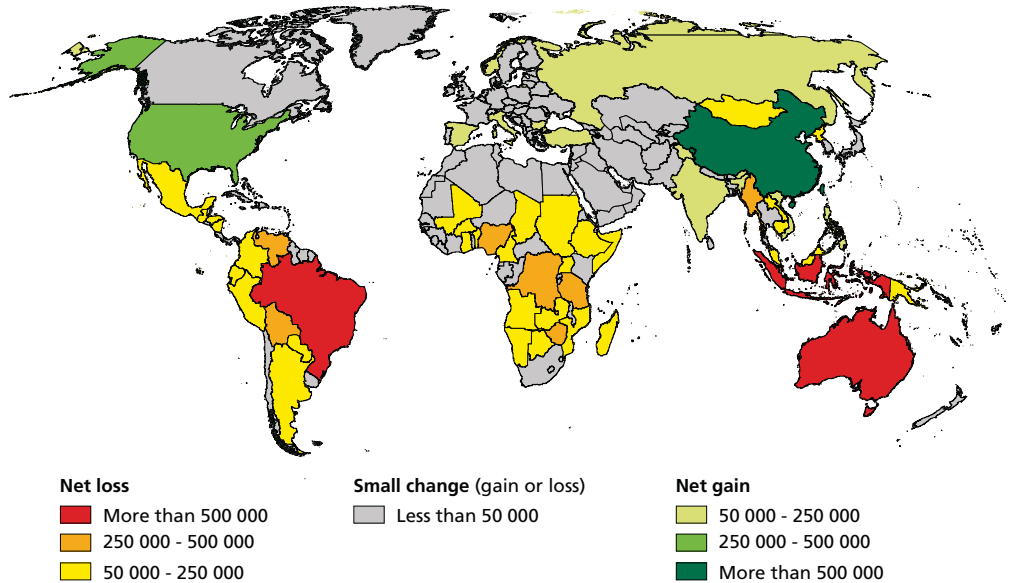
However, it is clear that most loss of forests continues to take place in the tropical region, while most of the gain takes place in the temperate and boreal forests in Asia (see Figure 12).

The causes of deforestation are many and vary from place to place. Generally speaking, most deforestation in Latin America results from large-scale conversion of forests to agricultural crops or to pasture for livestock, while most of the clearings in Africa are small-scale conversions to agriculture – often preceded by shifting cultivation. Asia had a positive balance in 2000–2010.

Although accurate figures are hard to come by, mismanagement of forests, fires and other causes have led to the degradation of millions of hectares of forests, which is often a forerunner for deforestation.

FIGURE 12

Annual change in forest area, 2005-2010 (hectares)



Source: FAO, 2010b.

**Climate change.** Forests, like other ecosystems, are affected by climate change and are slow to adapt to and recover from its effects. Forests are also subject to a variety of disturbances that are themselves strongly influenced by climate. Disturbances such as fire, drought, landslides, species invasions, insect and disease outbreaks, and climatic events such as hurricanes, windstorms and ice storms influence the composition, structure and functions of forests (Dale *et al.*, 2001). Climate change is expected to affect forests' susceptibility to disturbances, as well as the frequency, intensity, duration and timing of such disturbances. For example, increased fuel loads, longer fire seasons and the occurrence of more extreme weather conditions as a consequence of a changing climate are expected to result in increased forest fire activity (Mortsch, 2006).

**Insect pests and diseases, natural disasters and invasive species.** Outbreaks of forest insect pests damage nearly 35 million ha of forest annually, primarily in the temperate and boreal zones. The mountain pine beetle, *Dendroctonus ponderosae*, native to North America, has devastated more than 11 million ha of forest in Canada and the western USA since the late 1990s and is spreading well beyond its normal range – an unprecedented outbreak exacerbated by higher winter temperatures. Diseases, severe storms, blizzards and earthquakes also have damaged large areas of forest since 2000. Woody invasive species are of particular concern in small island

developing states, where they threaten the habitat of endemic species. Information availability and quality continue to be poor for most of these disturbances.

**Forest fires.** The last decade has seen many big fires with severe impacts on human lives, assets and forest areas. In Australia in 2009, 430 000 ha of vegetation burned, 2 133 homes were destroyed and 173 people died; in Greece in 2007, 270 000 ha of vegetation burned and 84 people died; and in the Russian Federation in 2010, about 6 million ha burned and 50 people died directly from fires – not counting the indirect impacts on human health through increased heat and smoke. For the year 2000, of the 350 million ha of global land area affected by fire (JRC-EU, 2005), a significant proportion was forest and woodland.

### **Progress in reversing forest loss**

Considerable progress has been made towards reversing the overall trend of forest area loss. Yet deforestation, including uncontrolled conversion of forests to agricultural land, continues at an alarmingly high rate in many countries and pressures are expected to increase in some regions because of an increase in population and the prediction that food production needs to increase by 70 percent by 2050. Considerable cross-sectoral efforts are needed to reach the goals of no net loss of forest area globally and sustainable management of all forests. Lessons can be drawn from countries that have satisfactorily reversed deforestation, including Costa Rica, the Philippines, India, China and Viet Nam.

## **■ Mountains**

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Mountains cover 24 percent of the Earth's land surface and they are home to 12 percent of the world's population, with a further 14 percent living in their immediate vicinity.

More than half the world's population relies on the freshwater that flows from mountains, and all the major rivers in the world – from the Rio Grande to the Nile – have their headwaters in mountains. Mountains, sometimes called nature's water towers, play a central role in collecting and storing fresh water. Yet today, as worldwide demand for freshwater continues to soar unabated, deforestation of mountain woodlands, mining, agriculture, urban sprawl and global warming are all taking their toll on mountain watersheds. For example, while the number of people on the planet has doubled over the last century, the demand for freshwater has jumped six-fold. Some of the freshwater obtained from mountains is stored in glaciers. Yet mountain ecosystems are extremely vulnerable to the impact of global warming and many mountain glaciers are melting at unprecedented rates.

### **Increasing awareness of mountain people and ecosystems**

Mountains received global attention for the first time at the Rio Earth Summit in 1992 where a chapter on mountain ecosystems was included in Agenda 21. Since

then, important progress has been achieved in mountain areas, thanks in particular to the International Year of Mountains 2002 and the launch of the Mountain Partnership, a global alliance created at the 2002 World Summit on Sustainable Development. It currently has more than 170 members, including governments, intergovernmental and non-governmental organizations. In some countries, as a consequence of these international efforts, national committees have been established to promote integrated mountain development involving all partners.

### **Mountains and food security**

Mountains are home to at least one-fourth of the world's poorest and most food-insecure people, yet development agendas often neglect them. Many mountain communities are plagued by shortages of food and periods of hunger. Nutrition studies indicate that mountain populations suffer from high rates of micronutrient deficiencies which, coupled with hunger, is the cause of the higher infant and maternal mortality rates in mountain regions. In many mountain areas, local people have traditionally depended on fish as an important source of animal protein, but today it is usually in short supply in mountain regions. In some regions, food insecurity is a consequence of chaos created by conflict and war. In others, periods of hunger arise as mountain farmers abandon traditional farming practices in favour of modern methods that prove unsustainable on fragile mountain terrain. Many men, women and families have no choice but to migrate to lowland cities, leaving their mountain communities to disintegrate and entire cultures and languages to disappear. One way to reduce the number of hungry people living in mountain areas is to empower them to protect local mountain ecosystems and their agrobiodiversity, and to promote peace and stability in mountain regions.

### **Mountain biodiversity**

Mountains are a major source of the biodiversity that contributes to the world's food production. Of the 20 plants that supply 80 percent of humanity's food, six



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**PHOTO 3**

Increased forest fire activity is one expected result of climate change.

– maize, potatoes, barley, sorghum, apples and tomatoes – originated in mountain areas. Several others found new homes in the mountains and evolved into many different varieties. Many of these species have disappeared from lowland areas, crowded out by human activities. Many others exist nowhere else but on mountains. Isolation and relative inaccessibility have helped protect and preserve species in mountains, and these precious reserves of genetic diversity provide insurance for the future, particularly as the demands of the global economy continue to turn lowland habitats into fields of high-yield, monoculture food crops that feed many of the world's people but are vulnerable to evolving pests and pathogens. Recently, however, a growing number of mountain farmers are abandoning age-old practices and adopting modern, high-yielding farming techniques that reduce biodiversity and tend to be unsustainable in mountain areas.

### **Natural hazards**

Mountains are highly susceptible to natural hazards. Many people in mountain regions who live in extreme poverty are forced to settle in unsafe areas. Their isolation means they do not receive warnings of impending threats and, if tragedy strikes, they wait longer for emergency help. At the same time, fragile mountain environments are under increased stress from the growing demands of modern society and climate change. Excessive logging strips protective forests. Development of tourism infrastructure upsets fragile ecological balances. Inappropriate road construction makes mountain slopes unstable and mismanaged mining raises the possibility of landslides. Gravity pushing down on sloping land compounds the destructive power of storms and heavy rains, producing avalanches, landslides and floods.

More than half of the deaths caused by natural disasters occur in mountains and adjoining lands. It is not possible to protect people completely from hazards, nor is it wise to wait until a catastrophe occurs. Developing integrated strategies and policies on disaster risk management at a national level, increasing capacity development for preparedness, mitigation response and rehabilitation are just some of the activities that need to be undertaken.

### **Working to overcome marginalization**

Although some progress has been made, and mountains are receiving more attention than before, they are still marginalized in the major decision-making processes, both at the global and national levels. The increasing demand for water, the consequences of global climate change, growth in tourism, population trends, the pressures of industry and agriculture in a globalized world are just some of the current challenges facing the sustainable development of mountain regions. Because mountain people reside far from centres of commerce and power, and suffer high rates of illiteracy, their voice in government policy- and decision-making is limited. Policy reforms, good governance and empowerment of local communities, as well as increased investment in mountain regions should feature more prominently on the development agenda.

## Biodiversity

One of the greatest challenges facing the world this century is to achieve global food security while conserving its biological resources and diversity. Long-term food security cannot be achieved if production gains are made at the expense of the natural environment. Biological diversity, defined by the Convention on Biological Diversity is “the variability among living organisms from all sources, including ... terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems” (UN, 1992).

Ecosystems are the assemblage of diverse living organisms interacting in communities, each within its own habitat. The diversity of ecosystems includes oceans, lakes, rivers, deserts, rangelands, forests, wetlands and mountains, and also landscapes modified by humans, such as croplands, pastures, reservoirs and woodlots. Scientific knowledge continuously advances in its understanding of ecosystem functions and of the ecological services from which humans derive benefits.

About 1.75 million species have been identified, with many scientists believing that there could be from 3 million to 100 million species yet to be documented. Understanding of genetic diversity has contributed enormously to improving agricultural production. Farmers have worked with genetic diversity for thousands of years to develop varieties of crops and breeds of livestock that meet their needs, and that are adapted to respond to production challenges such as changing temperatures, droughts and waterlogging, and to enhance their resistance to disease, pests and parasites. Fish farmers have only recently begun to domesticate a tiny fraction of the vast biodiversity of aquatic organisms. Most farmed aquatic organisms are still very closely related to their wild relatives.

### ■ The value of biodiversity: the basis of food security

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Biodiversity provides humans with food and nutrients, and is a source of raw materials for clothing, wood, shelter and fuel, draught power and transport, manure for fertilizing crops, plants for medicines, and materials for biofuels and manufacturing. Wild plants and animals are the origin of all domesticated crops, fish and livestock. Biodiversity provides ecosystem services essential for agriculture such as pollination, pest and disease regulation as well as nutrient cycling. Genetic diversity and adaptation enable farmers, fishers and livestock keepers to respond to changing environmental conditions and consumer demands for new and improved foods and other products. Indigenous peoples’ traditional food systems indicate the need to address food biodiversity in all its dimensions (Kuhlein, Erasmus and Spigelski, 2009).

Economic benefits deriving from biodiversity are significant. Agriculture is one of the world’s most economically important sectors, for both developing and developed countries. It is estimated that about 75 percent of the world’s poor live in rural areas and depend to some extent on some form of agriculture. Animal genetic

resources are estimated to contribute to the livelihoods of about 1 billion people and to provide 25 percent of the protein consumed by humans (FAO, 2009c). About 25 percent of the ice-free terrestrial surface on the planet is used for grazing, and 34 percent of total arable land is used for feedgrain production. Overall, agricultural production is the main source of income for half of the world's human population (FAO, 2010c).

Forest biodiversity is also an essential resource, with more than 1.6 billion people depending on forests to varying degrees for their livelihoods, providing them with income, food, fibre and fuel, and grazing for livestock. At least 350 million people live inside or near forested areas (FAO, UNEP and UNFF, 2010), and more than 10 million are employed in the formal forest sector (FAO, 2010d). Forest wildlife and aquatic resources are important sources of protein and income for many communities, as are other non-timber forest products including nuts, fruits, mushrooms, wild plants as vegetables, spices and many other food products. Forest biodiversity also provides economically valuable products such as oils, saps, resin and wax.

### **Aquatic biodiversity**

Oceans and seas provide about 90 percent of the world's fishery catch. In 2008, reported catches from inland waters exceeded 10 million tonnes, but actual production is believed to be many times higher. Accurate information on the biodiversity of inland fisheries is lacking, with more than half of the catch not even identified. Capture fisheries and aquaculture production supplied the world with about 115 million tonnes of food fish in 2008. Overall, fish provided more than 3 billion people with at least 15 percent of their average per capita animal protein intake. Lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes and swamps, provide a rich supply of biodiversity that is often an important source of food and income for local people. Aquaculture is the fastest-growing sector of animal-origin food production, and will soon overtake capture fisheries as a source of food fish. In 2008, nearly 45 million people were directly engaged, part time or full time, in primary production of fish, either by fishing or in aquaculture. Over the last three decades, employment in the primary fisheries sector has grown faster than the world's population and employment in traditional agriculture. (FAO, 2010e).

### **Ecosystem services**

Ecological processes that provide benefits for humans are termed ecological services. For example, biodiversity performs ecosystem services for farmers, livestock keepers, fishers and foresters, such as pollination, soil formation and maintenance of soil fertility, soil and water conservation, and disease regulation. Forests regulate hydrological cycles, ameliorate weather events, protect watersheds and assist in avalanche control. Aquatic ecosystems help maintain the Earth's hydrological cycle, provide for energy production and transport, recreation and tourism, nutrient cycling, and represent the largest carbon sink on the planet.



Biodiversity also plays a critical role in adaptation to environmental stress. For example, it enables humans to use genetic resources to select crops and animals and adapt them under changing production conditions. Biodiversity also contributes to ecosystem resilience. All humans depend on biodiversity to meet their basic needs for food, clean water and oxygen, and for a source of countless medicines and raw materials. Biodiversity is also of immense cultural, spiritual, recreational and social value.

### Biodiversity trends

Globally, biodiversity is being eroded and species are becoming extinct. According to biodiversity assessments, amphibians face the greatest risk, and coral species are deteriorating most rapidly in status; inland fish are the most threatened group of vertebrates used by humans. Nearly one-quarter of all plant species are estimated to be threatened with extinction. The abundance of assessed populations of vertebrate species fell by nearly one-third on average between 1970 and 2006, and continues to fall globally, with especially severe declines in the tropics and among freshwater species. Natural habitats in most parts of the world continue to decline in extent and integrity. Wetlands, sea-ice habitats, salt marshes, coral reefs, sea-grass beds and shellfish reefs all show serious declines, and forest loss and fragmentation continues (Secretariat of the Convention on Biological Diversity, 2010). The principal pressures driving biodiversity loss include habitat change, overexploitation of resources, pollution, invasive alien species and climate change. These stressors are constant or increasing in intensity (Millennium Ecosystem Assessment, 2005).

Despite significant efforts to conserve biodiversity and use resources and ecosystems in a sustainable manner, the biodiversity trends tend to be negative. This has implications not only for current food supply systems, but also for the future. Genetic diversity is an insurance policy against future threats to food security. Its loss reduces our capacity to adapt crops and livestock to environmental changes, emerging diseases or changing consumer demands. Most future scenario projections show high



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**PHOTO 4**

FAO has contributed to an improved understanding of how demand, competition and other market-related factors affect biodiversity and food production.



**BOX 5****FAO support for biodiversity conservation**

FAO will continue to play a pivotal role in improving food security, nutrition and poverty reduction while seeking to conserve natural resources, including biodiversity. Its activities include hosting and facilitating related meetings for its partners, policy-makers and natural resource stakeholders, and supporting field activities across the agricultural spectrum. FAO also participates in developing and managing a range of global assessments, approaches and instruments in the pursuit of conservation goals. Examples of activities include:

- promoting and supporting its member countries in the application of sustainable management approaches and codes of conduct, such as the ecosystem approach, sustainable agriculture, sustainable production intensification, sustainable diets, sustainable forest management, and the Code of Conduct for Responsible Fisheries (FAO, 1995, 2008b), as well as the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture and, under the guidance of the Commission on Genetic Resources for Food and Agriculture (CGRFA), the implementation of a Global Plan of Action for genetic resources in the different sectors;
- preparing global resource and biodiversity assessments and sectoral global plans of action, including fisheries and forests assessments and subspecific and genetic level assessments for plant, animal, aquatic and forest genetic resources planned in the CGRFA's Multi-Year Programme of Work and leading to the report on the *State of the World's Biodiversity for Food and Agriculture*, due in 2017;
- facilitating implementation of global instruments such as the International Treaty on Plant Genetic Resources for Food and Agriculture, the International Plant Protection Convention and the Rotterdam Convention.

levels of extinction and loss of habitats and loss of genetic resources continuing throughout this century, with associated declines in some ecosystem services that are important to human well-being (Millennium Ecosystem Assessment, 2005).

**Biodiversity conservation, food security and nutrition**

The many pressures on biodiversity and the urgent need to achieve global food security make it extremely challenging to achieve the sustainable use of natural resources. However, past and recent successes provide both hope and experience. Biodiversity in domesticated species requires continuous human management, and global plans of action for animals and plants, prepared by FAO, are providing a basis for improving management, including ensuring farmers and livestock keepers

have appropriate economic, social and ecological reasons to keep using particular breeds or varieties, thus reducing the risk of their becoming extinct. Conservation and new patterns of sustainable use are being promoted, and there is an improved understanding of how economic and market-related factors (e.g. changing demand, competition) affect biodiversity and food production. There is also a need to address the degradation of natural resources and lack of access to these resources on the part of farmers and livestock keepers.

Greater efforts are needed to meet the challenge of achieving food security while conserving and sustaining biodiversity, including:

- more effective governmental leadership to ensure that there is a national vision for biodiversity while pursuing food security and economic development;
- improved resource stewardship by people, governments, business interests and organizations;
- improved application of the ecosystem approach in fisheries and aquaculture, forestry and agriculture (also known respectively as sustainable forest management, sustainable production intensification and sustainable fisheries management);
- greater investment in biodiversity in all countries and financial and technical assistance for developing countries.

There are grounds for hope that food security and nutrition can be achieved and the loss of biodiversity halted if policy and economic frameworks are set correctly, awareness of the need to live within the capacity of the Earth's natural resources and systems grows, and significant investments are made to achieve the sustainable use of natural resources. FAO remains committed to supporting its member countries in their efforts to achieve food security and eradicate poverty, while maintaining the Earth's natural resources and rich biodiversity.

## Conclusion

In many countries, food security depends on the performance of local agricultural production, but the natural resource bases of some of these countries are not sufficient to make significant progress and in many cases, the resources that do exist constantly face pollution, degradation and depletion.

Global land mass comprises 13.3 billion ha, of which about 12 percent is used for cultivation of agricultural crops; 31 percent is under forest; and 40 percent comprises grasslands, woodlands, wetlands and other ecosystems. Yet, by today's accounting:

- one-third of global arable land has been lost through erosion in the last 50 years;
- forest ecosystems have declined by about 15 percent in the last 50 years, and deforestation averaged around 13 million ha per year for the last decade (which an improvement over the 16 million ha average of the previous decade);

- nearly one-quarter of all plant species are threatened with extinction;
- irrigated land more than doubled from 140 million ha in 1961 to 300 million ha in 2009, increasing production but, when not well managed, contributed to depletion of aquifers, waterlogging, salinity and an inequitable distribution of the benefits from increased production.

The availability of quality land, water, forest and biodiversity resources is critical for food security. FAO is committed to ensuring land tenure security for local landowners and supports the principles of sustainable land management (SLM), which is based on the full involvement of local land users in management processes. Calling for greater efforts to achieve food security while conserving and sustaining natural resources, FAO promotes ecosystem approaches and works with governments but also with the private sector and civil society to design and implement guidelines, codes of conduct and other international instruments to set the path towards a more sustainable use of natural resources.

## CHAPTER 3

# Climate change

The world has awakened to the reality that our climate shows alarming signs of changing – more rapidly and more dramatically than at any time in recorded history. Climate change affects the frequency of extreme weather events, alters agricultural growing patterns and affects the distribution patterns of pests, weeds and diseases that threaten crops and livestock. The overall impacts of climate change on agriculture and food security are expected to be increasingly negative, especially in areas already vulnerable to climate-related disasters and food insecurity. The implications for food production, food security, agriculture, forestry and fisheries are enormous. Understanding those implications, and analysing how agriculture can be part of the solution as well as part of the problem, is fundamental.

## The threat of climate change

Climate change poses a serious threat to food security for many of the world's poorest countries and millions of its poorest households, although the threat is certainly not limited to poor countries. Rich and poor countries alike will feel the impact of changing rainfall patterns, extreme weather events and rising sea levels. The difference is that poor countries – and vulnerable groups in those countries – lack the financial resources available to wealthier countries to enable them to reduce their risk (UNDP, 2006).

Climate change refers to the variations in climate on many different time scales, from decades to millions of years, and the possible causes of such variations. It may result from natural factors in the climate system, or from consequences of anthropogenic (human) activities, such as increasing atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases (GHGs). It also can be affected by changes in solar activity and in the Earth's orbit around the sun.

### ■ Climate change impacts at different levels

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Science has made great progress in understanding the global, continental and regional impacts of climate change, although when, where and how it will affect specific countries remains uncertain. Changes in temperature and precipitation, and increases in extreme weather events are likely to affect the potential for food production in many areas of the world, especially in Africa and Asia. Potential effects include disruption of food distribution systems and their infrastructure and changes in the purchasing power of the rural poor.

**BOX 6****Global assessment of climate change**

Changes in the atmosphere, the oceans and glaciers and ice caps now show unequivocally that the world is warming, according to the Intergovernmental Panel on Climate Change (IPCC). With major advances in climate modelling and the collection and analysis of data, scientists have determined with a high level of confidence that the marked increase in atmospheric concentrations of GHGs, such as CO<sub>2</sub>, methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) since 1750 has resulted from human activities (IPCC, 2007a).

In considering the impacts of climate change, vulnerability and prospects for adaptation, the IPCC has concluded, among other things, that precipitation, runoff and water availability are very likely to increase at higher latitudes and in some wet tropics, including populous areas in East and Southeast Asia. On the other hand, they are expected to decrease over much of the area in the mid-latitudes and dry tropics, which are already water-stressed. The Panel also considered it very likely that the upward trend in hot extremes and heat waves would continue. Drought-affected areas are expected to increase and extreme precipitation events are predicted to become more frequent and more intense, thus increasing the risk of floods. It is also probable that, in the near future, tropical cyclones, typhoons and hurricanes will become more intense, bringing higher peak wind speeds and heavier precipitation, as a result of the increase in tropical sea surface temperatures. At the same time, there is less confidence in projections of a global decrease in numbers of tropical cyclones (IPCC, 2007b).

The IPCC clearly indicates that improving the ability to assess climate change impacts at national and subnational levels will require improvements in the extent and quality of climate variability monitoring because short-term climatic fluctuations have profound implications for food security. There is a great need for detailed impact assessments for agriculture that take into consideration the physical, biophysical and socio-economic complexities of, for example, African countries, which is where most vulnerable populations live (Gommes *et al.*, 2009). These assessments require databases of climatological, meteorological, phenological (plant and animal life cycle events), soil and agronomic information as well as related methods and tools (Ramasamy and Bernardi, 2010).

**Ecosystems**

Species, organisms and ecosystems have adapted to their regional climates continuously over time. Changing climates can potentially alter ecosystems and the many resources and services they provide to each other and to society. The IPCC concluded that, if global mean temperatures increase by 2 °C to 3 °C compared with pre-

industrial levels, 20 to 30 percent of species assessed may be at risk of extinction this century. These changes may have either adverse or beneficial effects on species. For example, climate change could benefit certain plant or insect species by increasing their geographic distribution, with either positive or negative impacts on ecosystems and humans, depending on whether the species are invasive, such as weeds or mosquitoes, or valuable to humans, such as food crops or pollinating insects.

During this century, if GHG emissions and other changes continue at or above current rates, the resilience of many ecosystems is likely to be threatened by an unprecedented combination of change in climate and other global change drivers, especially land-use change and overexploitation. By 2100, ecosystems will be exposed to atmospheric CO<sub>2</sub> levels that will be substantially higher than during the past 650 000 years, and to global temperatures that will be at least among the highest of those experienced in the past 740 000 years. This will alter the structure, reduce the biodiversity and upset the functioning of most ecosystems, thereby compromising the services they currently provide (IPCC, 2007b).

### **Aquatic ecosystems**

Climate change is bringing substantial changes to the world's capture fisheries, which are already under stress from other influences. Inland fisheries – mainly found in developing countries of Africa and Asia – are at a particularly high risk which, in turn, threatens the food supply and livelihoods of some of the world's poorest populations. There are also consequences for aquaculture, which is especially significant for populations in Asia. Climate change will probably have an impact on fish community composition, production and seasonality processes in plankton and fish populations. In general, climate change is expected to drive the ranges of most terrestrial and marine species towards the poles, expanding the range of warmer water species and contracting the range of colder water species.

There is evidence that inland waters are warming. Generally, high-latitude and high-altitude lakes will experience reduced ice cover, warmer water temperatures, a longer growing season and, consequently, increased algal abundance and productivity. In contrast, some deep tropical lakes will experience reduced algal abundance and declines in productivity.

For aquaculture, a rise in sea level in coming decades will increase the upstream intrusion of salt water, affecting brackish water and freshwater culture practices. The expected increase in extreme weather events may also affect aquaculture through the physical destruction of facilities, loss of stock and spread of disease. At the same time, climate change might also offer opportunities for aquaculture. Some inland waters could experience an increase in the availability of phytoplankton and zooplankton, which would boost production. While increased salinity in deltas will push some aquatic farming upstream, it could also provide additional areas for shrimp farming, which is often a higher-value commodity.

Fisheries-dependent economies, coastal communities and fishers are expected to experience the effects of climate change in a variety of ways, with displacement and migration of human populations; coastal communities and infrastructure facing

sea-level rise and changes in the frequency, distribution or intensity of tropical storms; and less stable livelihoods and nutritional issues owing to changes in the availability and quantity of fish for food. Fisheries governance will need flexibility to take account of changes in stock distribution and abundance. The form of governance that is generally considered to be the best for improving the adaptive capacity of fisheries is an ecosystem approach that aims to achieve equitable and sustainable fisheries and accepts inherent uncertainty (Cochrane *et al.*, 2009).

## Livestock

Livestock contribute 40 percent of the global value of agricultural output and support the livelihoods and food security of almost 1 billion people. Today, rapidly rising incomes and urbanization, combined with underlying population growth, are driving demand for meat and other animal products in many developing countries. Supply-side factors, such as the globalization of supply chains for feed, genetic stock and other technologies, are further transforming the structure of the sector.

Livestock production places increasing pressures on natural resources. Corrective action, needed to encourage the provision of public goods such as valuable ecosystem services and environmental protection, should involve addressing policy and market failures and developing and applying appropriate incentives and penalties.

The livestock sector is increasingly recognized as both a contributor to the process of climate change as well as a victim. Policy interventions and technical solutions are therefore required to address both the impact of livestock production on climate change and the effects of climate change on livestock production.

GHGs can arise from all the main steps of the livestock production cycle: emissions from feed-crop production and pastures are linked to the production and application of chemical fertilizer and pesticides, to loss of soil organic matter, and to transport. In addition, when forest is cleared for pasture and feed crops, large amounts of carbon stored in vegetation and soil are released into the atmosphere.

In contrast, the livestock sector can play a key role in mitigating climate change. The adoption of improved technologies, encouraged by appropriate economic incentives, can lead to reduced emissions of GHGs by livestock and, when good

**PHOTO 5**

The livestock sector is both a victim and a contributor to the process of climate change.



management practices are implemented on degraded land, pasture and cropland can become net carbon sinks, sequestering carbon from the atmosphere.

Some of the greatest impacts of climate change are likely to be felt in grazing systems in arid and semi-arid areas, particularly at low latitudes. Here, climate change effects on forage and range productivity will have far-reaching consequences for animal production. Reduced rainfall and increased frequency of droughts will reduce primary productivity of rangelands, leading to overgrazing and degradation and possibly resulting in food insecurity and conflict over scarce resources. There is also evidence that growing seasons may become shorter in many grazing lands, particularly in sub-Saharan Africa, and it is probable that extreme weather events will increase.

### **Demographics**

Recent studies show that population growth has been one driver of the increase in CO<sub>2</sub> emissions over the past several decades, and that urbanization, ageing, and changes in household size also affect energy use and carbon emissions. Urbanization may lead to an emissions increase of more than 25 percent, particularly in developing countries. This indicates that CO<sub>2</sub> emissions scenarios need to pay greater attention to the implications of urbanization and ageing, particularly in areas such as China, India, the USA and the European Union (O'Neill *et al.*, 2010).

In addition, the number of people living outside their country of birth increased from 75 million in 1960 to 191 million in 2005, a rise from 2.5 percent to 3.0 percent of the world's population. If the percentage of international migrants either stays at 2005 levels or continues to rise at the same rate as in the last decades of the twentieth century, there will be between 235 and 415 million international migrants in the world by 2050, 40 percent more than at present. At the same time, movement within national borders is at least as significant numerically as international migration, and is certainly the most significant form of migration for poor people (Black *et al.*, 2008). Climate change is certainly one of the drivers for additional mass migration estimated to range from 150 to 200 million (Stern, 2007).

### **Food supply**

Climate change will affect all four dimensions of food security: food availability, access to food, stability of food supplies, and food utilization – with the overall impact differing across regions. Climate change will increase the dependency of developing countries on imports and accentuate the existing concentration of food insecurity in sub-Saharan Africa. It will also affect South Asia. Based on quantitative assessments, the first decades of the 21st century are expected to experience low impacts from climate change, but also lower incomes and a still higher dependence on agriculture. During these first decades, the biophysical changes will be less pronounced but climate change will have a particularly adverse effect on those who are more dependent on agriculture and have less capacity to cope with its impacts. By contrast, the second half of the century is expected to bring more severe bio-



physical impacts but also a greater ability to cope with them (Schmidhuber and Tubiello, 2007).

In addition to the impact of increasing population, urbanization, biofuel competition, and natural resource stresses caused by direct effects of climate change, its impact also will be especially felt in terms of reduced productivity in tropical low-latitude regions where many poor countries are located and where production growth is most needed. Potential agricultural output up to 2080–2100 may be reduced by up to 30 percent in Africa and up to 21 percent in developing countries as a whole. The total future demand for agricultural commodities may exceed the demand for food and feed more or less significantly, depending on the expansion of demand for biofuels and on the technology used for the conversion of agricultural biomass into biofuels. The development of the bioenergy market will determine how well it will be possible to meet the growing demand with the available resources and at affordable prices (FAO, 2009d).

### **Plant, animal and human health**

Changes in the incidence, distribution and intensity of pests and diseases resulting from climate change are likely to cause additional crises in plant and animal health. The range of crop weeds, insects and diseases is likely to expand, and climate change is expected to affect vector-borne diseases and may also result in new transmission pathways and different host species.

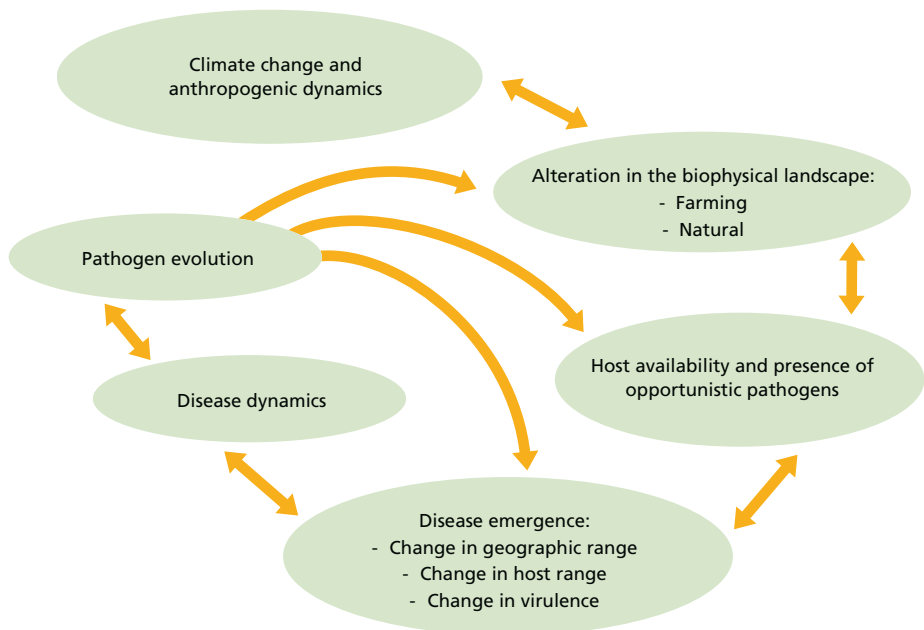
The emergence of diseases – whether infections appearing for the first time in a population or diseases that have existed in the past but are rapidly increasing in incidence or geographic range – may take different forms. The most common is a change in the geographic range of a disease. Less frequent and more dramatic is a jump in virulence. In a third category of disease emergence, the pathogen will adjust its host range, which may take the form of a species jump, including from animals to humans. The risk of a severe pandemic causing millions of human casualties and disrupting society and the global economy remains real. Figure 13 depicts the relevant pathogen-host-environment interactions.

The three disease emergence pathways broadly correspond with typical sets of drivers: changes in host range, shifts in disease virulence and range expansion.

- *Host range change.* A species jump may occur in a situation where the host habitat, the host community composition or the host contact network structure becomes altered so that increasingly more spillover takes place to a new and/or alternative host. While landscape changes, such as the encroachment of forest and game reserves, are among the common set of drivers, usually there is no single cause. Climate change forms part of this pathway of disease emergence, along with the effects of land pressure, deforestation and loss of biodiversity.
- *Virulence shifts.* The role of climate change in virulence shifts is less obvious. However, the disease emergence category featuring an expansion of the geographic range of the disease is both relatively common and more likely to be affected by climate change. This group of diseases comprises arthropod

FIGURE 13

## The effects of climate change on disease emergence



Source: FAO.

vectors, migratory birds, and pathogens carried by food and inanimate objects, or fomites. A set of global factors is believed to be driving a worldwide redistribution of hosts, vectors and pathogens. Climate change almost invariably plays a role, enhancing or decreasing the introduction and invasions of disease agents, caused by the greater mobility of people, increasing trade and traffic volume of animals, animal products and commodities. Pathogens transmitted by arthropod vectors are sensitive to climate change because humidity and temperature are essential to the environmental “envelope” of the vector, dictating distribution, ecology and behaviour. An early spring or an increase in weather extremes will also affect vector abundance and disease transmission.

- *Range expansion.* Range expansion may take the form of a travelling wave, with new colonies being established just outside the perimeter of existing disease distribution, coalescence of growing colonies, or involving saltation, with disease introduction into new areas and ecological settings. Long distance dispersion may result from human action while climate change may facilitate the establishment and colonization of an area by a disease complex where introductions have failed in the past. These dynamics would explain the ongoing encroachment of insect-borne diseases in temperate northern climate zones.

In general terms, climate change will enhance the emergence, and also extinction, of diseases at the animal-human-ecosystem interfaces. The ongoing globalization of diseases is difficult to manage, and a climate-smart farming landscape and more disease-resistant agro-ecological systems will require twin strategies – focusing on drivers of the disease and increasing resilience. Whereas progressive control of infectious diseases in humans and animals has proven a viable strategy, current dynamics in terms of new emerging diseases suggest that more attention should go to the drivers of disease flare-up. In addition, prevention will have to extend beyond the technical, to developing social and ecological resilience to the incursion of disease.

## Adaptation and mitigation in agriculture

The effects of climate change – more frequent and intense weather events, shifts in seasons, pest and disease patterns, increases in salinity and rising sea levels – have already had an impact on many countries. This has focused attention on the fact that agriculture in developing countries must undergo a significant transformation in order to achieve food security and respond to climate change (FAO, 2010f). Efforts should start with the adoption of practices and technologies that can improve farming systems in ways that support food security and development, but the transformation must also include a shift to more holistic views that recognize at once the increasing demands that climate change has put on agriculture and the range of benefits it can provide.

Agriculture needs to produce more food, feed and fibre through higher productivity. It needs to reduce wastage and to make it easier for farmers' products to reach markets and consumers. Agricultural production systems must become more resilient to disruptive events such as floods and droughts. This requires improving agriculture's management and use of natural resources, such as water, land and

### PHOTO 6

Adapting to climate change involves both disaster risk management and medium- to long-term adaptive change management, which requires modifying behaviours and practices.



forests, soil nutrients and genetic resources; and of external inputs, such as fertilizers and energy. At the same time, agriculture must establish better monitoring, warning and insurance systems, as well as finding ways to reduce its environmental impacts – including lowering its own GHG emissions – without compromising food security and rural development (FAO, 2010g).

Food security and climate change challenges will have to be addressed simultaneously, urgently and in a coherent manner. Transformations are needed in both commercial and subsistence agricultural systems, but with significant differences in priority and capacity. In commercial systems, increasing efficiency and reducing emissions, as well as other negative environmental impacts, are key objectives. In agriculture-based countries with a dependence on subsistence systems, the priority is to increase productivity to achieve food security (FAO, 2010f).

### ■ Promoting adaptation to changing climate

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Adaptation is a matter of urgency, in particular for LDCs and SIDS. People who are already vulnerable and food-insecure are likely to be the first affected by climatic change. Adaptation requires adjustments to current or expected variability and changing average climate conditions, which can make it possible to moderate negative effects and take advantage of opportunities (IPCC, 2007b). It involves both disaster risk management, with its short-term focus on prevention, mitigating risks and preparing to deal with shocks, and medium-to-long-term adaptive change management, which requires modifying behaviours and practices (FAO, 2011d). Adaptation planning takes place at multiple levels, ranging from national planning to regional institutional development and to family farm planning. No matter the scale, adaptation targets the well-being and livelihoods of the men and women who are dealing with climate change impacts.

Most ecological and social systems have built-in adaptation capacities, but the climate variability and rapid rate of climate change now being experienced will impose new and potentially overwhelming pressures on those capacities, with current coping ranges likely to be exceeded more frequently and more severely. Indigenous knowledge of farmers, forest-dependent people and fishers and fish farmers can be a valuable entry point for localized adaptation. Nevertheless, to address complex and long-term problems caused by the changing climate, indigenous knowledge often needs to be complemented by scientific expertise (FAO, 2011d).

Adaptation involves combinations of strategy, policy, institutional and technical options that require a wide range of skills and multidisciplinary actions, including ecosystem-based and livelihood approaches. Particular attention has to be given to the most vulnerable groups and communities, e.g. those in fragile environments such as drylands, mountain areas, lakes and coastal zones (FAO, 2009e), as well as those disadvantaged by socio-economic factors such as land ownership, gender, caste and age constraints.

**BOX 7****Livelihood adaptation to climate change in Bangladesh**

Five districts of Bangladesh regularly threatened by spells of drought or increasing salinization and seasonal flooding benefited from the Livelihood Adaptation to Climate Change Project. The Bangladesh Department of Agriculture and Extension (DAE) and FAO implemented the project from 2005 to 2009, as a subcomponent of the Comprehensive Disaster Management Programme implemented by the Government of Bangladesh and the United Nations Development Programme (UNDP).

Through the promotion of current climate risk management, combined with technical and institutional capacity development for medium- to long-term climate change adaptation, the project established a strong, collaborative institutional mechanism for the identification, validation, testing, evaluation and sharing of adaptation options. A country-specific menu of 90 adaptation practices covering various sectors was developed through a participatory process, linking bottom-up livelihood perspectives and top-down government perspectives. About 800 field demonstrations of local adaptation practices were conducted, monitored and analysed through the collaboration of extension staff, community groups and Farmer Field and Farmer Climate Schools as well as researchers.

By replicating successfully tested practices and incorporating them into district and subdistrict sectoral development plans, the project reached about 12 500 farmers through farmer field days, individual demonstrations and joint learning sessions. Selected good practices have been shared through international databases. The project facilitated the incorporation of climate change in the updated Plan of Action for disaster risk reduction of the DAE as well as the formation of a DAE working group on climate change. It also provided important insights on the successful initiation of adaptation processes that can be replicated in other countries and regions.

Effective adaptation involves creating the capacity to cope with more frequent, increasingly difficult conditions and gradual climate changes, even without being able to anticipate their precise nature. Under such circumstances, the focus will be on decision-making and capacity development that strengthen institutions, social learning, iterative planning, innovation and development processes. This means taking a “no regrets” approach, promoting adaptive actions that will be beneficial even if future impacts are uncertain and climate change threats do not occur exactly as anticipated (FAO, 2009f).

FAO supports countries in assessing climate change impacts and vulnerabilities, disaster risk management, sustainable land, water and biodiversity management, strengthening institutions and policies for adaptation, developing and disseminat-

ing technologies, practices and processes for adaptation and accessing potential sources of adaptation financing (FAO, 2009f).

### ■ The agriculture sector as part of the climate change solution

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While agriculture is one of the sectors most vulnerable to the impacts of climate change and variability, agriculture, forestry and land-use change also contribute a significant share to global GHG emissions. According to the IPCC, 13.5 percent of global emissions originate from agriculture, mainly in the form of CH<sub>4</sub> and N<sub>2</sub>O from fertilized soils, biomass burning, rice cultivation, enteric fermentation and manure, and fertilizer production. Three-quarters of the agricultural emissions originate from developing countries. Deforestation and forest degradation account for another 17 percent of global emissions (IPCC, 2007b).

Nevertheless, agriculture and forestry should not be seen as separate problems, but as part of a comprehensive solution. Existing forestry and agriculture practices have significant potential for mitigation by reducing, avoiding or displacing net GHG emissions and acting as a sink for carbon through enhancement of carbon stocks in biomass and soil. The inclusion of the agriculture and forestry sectors into mitigation efforts is crucial to keeping the impacts of climate change within limits that society can reasonably tolerate, which means stabilizing the increase of global average temperatures within a 2 °C range (UN-REDD, 2011).

Reducing Emissions from Deforestation and Forest Degradation (REDD+) is cited as one of the most cost-effective approaches to mitigation. Its objective is to provide a financial value for the carbon stored in forests and to provide incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. REDD+ goes beyond deforestation and forest degradation and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. The potentially significant North-South flow of funds for REDD+ action in developing countries could reward reductions of carbon emissions and may also support new, pro-poor development, help conserve biodiversity and secure vital ecosystem services and resilience to climate change. However, to achieve these multiple benefits, REDD+ requires the full engagement and respect for the rights of indigenous peoples and other forest-dependent communities (UN-REDD, 2011).

While suitable technologies and practices and economically feasible mitigation mechanisms exist, more work is needed to create the required capacity and infrastructure for their implementation over a wide range of farming systems and agro-ecological zones. In addition, simple but effective, accurate and verifiable methodologies for measuring and accounting for changes in carbon stocks are required. The challenge is to design financing mechanisms for remuneration of environmental services in general and for GHG mitigation services – through carbon sequestration and/or reducing CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions in agricultural systems – provided by smallholder agriculture and forestry and the fisheries sector (FAO, 2009f).

**BOX 8****Mitigation of Climate Change in Agriculture**

With an overall goal of making agriculture part of the solution to climate change, the Mitigation of Climate Change in Agriculture (MICCA) Programme has begun efforts to improve the collection and generation of data and fill data gaps regarding GHG emissions and mitigation potential, as well as to pilot projects that test agricultural practices and their contribution to mitigation in five developing countries. A five-year multi-donor trust fund project launched in early 2010, MICCA supports efforts to mitigate climate change through agriculture in developing countries and move towards carbon-friendly agricultural practices. In its first two years, the project will build the global knowledge base in the agriculture sector, but also focus on the global economic analysis of climate policy options, provide technical information in support of the United Nations Framework Convention on Climate Change (UNFCCC) process, and assess the synergies and trade-offs between agricultural mitigation, agricultural development and food security.

FAO supports country efforts in climate change mitigation through advocacy and by generating and disseminating data, knowledge and as well as supporting appropriate institutional structures in realizing the mitigation potential of agriculture, forestry and other land-use sectors (FAO, 2009f). UN-REDD and the Mitigation of Climate Change in Agriculture (MICCA) project (introduced in Box 8) are FAO's two major programmes for climate change mitigation. The UN-REDD programme is a collaborative partnership involving FAO, UNDP and the United Nations Environment Programme (UNEP). It assists developing countries in preparing and implementing national REDD+ strategies and it builds on the convening power and expertise of the three agencies in related economics, monitoring, governance, ensuring multiple benefits, and stakeholder engagement.

**Climate-smart agriculture – building synergies**

The food and agriculture sector is unique in the sense that adaptation and mitigation often go hand in hand (FAO, 2008c). Recognizing this, FAO promotes an integrated approach, building synergies among climate change adaptation and mitigation, food security and sustainable development. Food security and climate change can be addressed together by transforming agriculture and adopting practices that are “climate smart”. These are the types of production system that increase productivity and resilience to climate change sustainably, reduce or remove GHGs and enhance the achievement of food security and development goals. They are crucial for achieving both food security and climate change goals (FAO, 2010f).



**BOX 9****Climate-smart agroforestry**

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Agroforestry is the use of trees and shrubs in crop and/or animal production and land management systems. Agroforestry systems range from improved fallows, home gardens and intercropping to fodder banks, live fences and tree apiculture. They provide multiple benefits for food security, climate change adaptation and mitigation. For example, they can increase resilience to extreme weather events and soil erosion through improved water retention and enriched soil quality, including soil fertility. They can also:

- diversify income sources and provide income buffers during crop failures;
- enhance productivity through integrated land-water management approaches;
- provide fodder, timber and fuelwood; and
- sequester carbon in vegetation and soils.

**BOX 10****Climate-smart fisheries and aquaculture**

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Adaptation to climate change is a key concern for the 540 million people who depend directly or indirectly on fisheries and aquaculture for their livelihoods, and are already facing many problems from overfishing, poor management and other terrestrial impacts. Broad implementation of the Code of Conduct for Responsible Fisheries and the promotion of climate-resilient sustainable intensification of aquaculture are examples of adaptation strategies in the sector.

Despite their relatively small contribution to GHG emissions, fisheries and aquaculture can play a role in mitigation through reductions in energy consumption and emissions along the supply chain as well as through sequestration of carbon. For example, establishing semi-intensively managed pond aquaculture or replanting mangroves in many aquaculture and fisheries areas could contribute significantly to the sequestration of carbon. Conducting extractive aquaculture operations with seaweeds and filter feeders can enhance carbon retention and capture in coastal ecosystems. The use of more energy efficient vessels, facilities, transportation systems, fishing gear and practices would lower fuel costs, reduce the carbon footprint and decrease the impacts on marine and atmospheric ecosystems – a potential win-win for fishery resources and those dependent on them.



For example, production systems can be enhanced by: i) improving components such as soil and nutrient management, water harvesting and use, appropriate irrigation scheduling, pest and disease control, management of genetic resources and harvesting, processing and supply chains; and ii) by promoting climate-resilient approaches that are appropriate to local environmental-geographical conditions. These include integrated rice farming systems, conservation agriculture, urban horticulture, integrated food-energy systems, low-energy-use aquaculture systems, sustainable forest management, more efficient livestock production systems, integrated cropping-livestock production systems and agroforestry (FAO, 2010f).

**BOX 11****Country support in conservation agriculture**

Following is a selection of recent conservation agriculture cases (FAO, 2010f) in different countries and regions:

In *Uzbekistan*, where monocropping of cotton is commonplace, FAO has contributed to increasing the productivity of cotton through conservation agriculture, including no-till, and diversification by rotating cotton with wheat and grain legumes and selected cover crops. *Results*: improved soil quality, crop development and yields, all well received by farmers.

In *Egypt*, where the rice-cropping systems of the Nile Delta burn more than 50 percent of the 3–5 million tonnes of rice straw residues produced annually in the field as a practical means of disposal, conservation agriculture has introduced rice in rotation with a forage legume or wheat. *Results*: yields achieved under conservation agriculture equal to those grown under conventional practices with savings in time, fuel and labour needed for land preparation and crop management, as well as improved weed control, crop water consumption and improvement of soil conditions.

In *Lesotho*, where farmers attended training in conservation agriculture, a crucial prerequisite for the correct adoption of the practice, along with a certain level of social capital, education and economic incentives for vulnerable households. *Results*: farmers have been able to boost agricultural yields and increase food production and overall resilience.

In *Honduras*, where farmers moved from a traditional slash-and-burn system to *quesungual*, a conservation agriculture system that uses trees and mulch. *Results*: from the third year, yields of maize and sorghum increased, leading also to additional biomass for grazing and fodder sale. The application of the system not only meets the household subsistence needs for fruit, timber, fuelwood and grains, it generates a surplus which can be sold, providing an additional source of income.

Many effective climate-smart practices already exist and could be widely implemented in developing countries. However, considerable investment is still needed. It is still necessary to fill data and knowledge gaps, research and develop appropriate technologies, and provide incentives to encourage the adoption of climate-smart practices. Funding should also be targeted towards revitalizing research and development linkages and rebuilding neglected national agricultural extension services so they can support farmers as they make the transition to climate-smart agriculture. For example, the Farmer Field School system pioneered by FAO, along with Junior Farmer Field and Life Schools, offer valuable channels for knowledge transfer and for promoting climate-smart farming techniques. Public-private partnerships also need to be supported.

FAO has supported many countries over the last decades in promoting conservation agriculture, a no-till farming system (see section on Sustainable agricultural intensification in Chapter 6). Conservation agriculture is currently practised on 100 million ha of land across the world, on all sizes of farms and agro-ecological systems, especially in developing and emerging economies because of its tremendous potential for achieving sustainable and profitable agriculture based on the three principles: minimal soil disturbance, permanent soil cover and crop rotations.

Looking to the future, greater coherence among agriculture, food security and climate change policy-making is urgently needed to be able to capture synergies. Effective mechanisms that promote dialogue among policy-makers working in these areas still need to be established. In addition, effective systems of property policy and rights, use and access rights, and law enforcement are essential to improving natural resource management. To achieve greater coherence, what is required is an integrated landscape approach that takes into account all land uses in a holistic way and ensures that objectives among sectors do not compete with each other.

### **Energy for and from agriculture**

As demand for food and energy grows, it will become more crucial to optimize land use and minimize fossil fuel dependence while ensuring food security. It is clear that land use will come under severe pressure to fulfil future energy and food needs. On the one hand, meeting the MDG goal of halving the proportion of undernourished people by 2015 will require a significant increase in the current level of commercial energy inputs into agriculture, particularly in developing countries (Best, 1998), a challenge compounded by the fact that agriculture will have to increase food production by 70 percent by 2050 – mainly through productivity increases. On the other hand, global energy demand is projected to increase by 45 percent between 2006 and 2030, and could double by 2050. Energy prices are projected to rise and become more volatile. Agriculture can, however, play a crucial role in supplying energy, through bioenergy. The global potential of sustainable bioenergy production is expected to account for 25 to 30 percent of global energy by 2050, including a tenfold increase in the production of liquid biofuels (IEA Bioenergy, 2010).

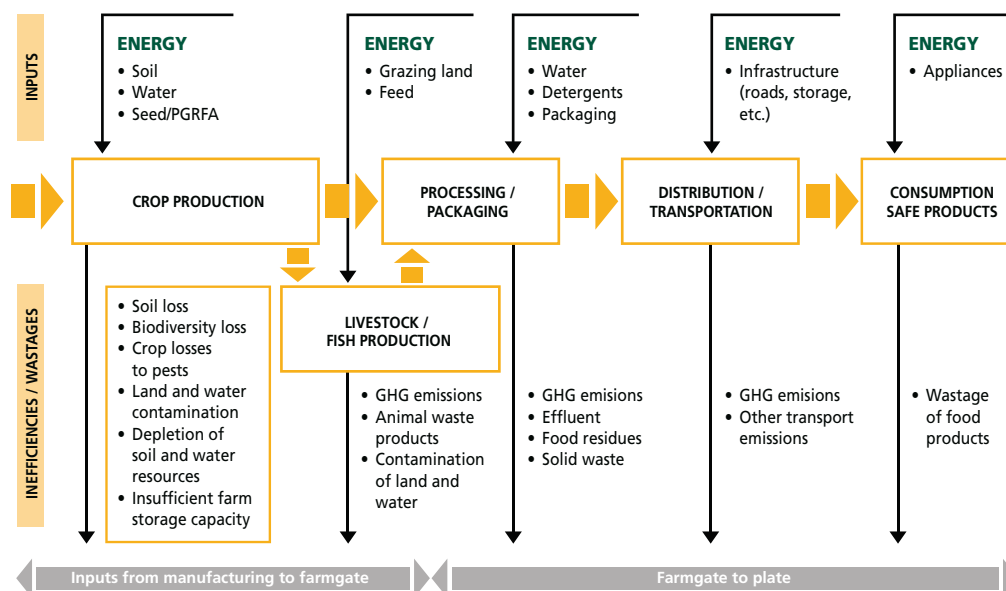
## ■ Addressing the food-energy-climate change nexus

Population growth, higher per capita food expenditures, and a greater reliance on energy-reliant technologies have all contributed to boosting food-related energy consumption (Canning, 2010). In OECD countries, the agriculture sector accounts for 3 to 5 percent of energy consumption. In developing countries, the figure is 4 to 8 percent (FAO, 2000a). In addition, food processing and transport in industrialized countries consumes up to twice the energy used by agriculture. In 2007, the USA's food system accounted for almost 16 percent of the nation's energy use. Between 1997 and 2002, more than 80 percent of its increase in annual energy consumption was food-related, with most of the increase in post-harvest stages.

Fossil fuel dependence along the food chain is high. By some estimates, more than 90 percent of food involves oil or natural gas for fertilizers, agrochemicals, tilling, cultivation and transport (Skrebowski, 2007). This is a precarious situation because of the resulting contribution to climate change and to the cost of inputs and on farming systems. At all production stages, fossil fuel combustion for heat and energy represents a major source of agricultural GHG emissions. In addition, nitrogen fertilizer production accounts for about 50 percent of the fossil fuel used in agricultural production (Foresight, 2011) and consumes about 5 percent of global natural gas supplies, while significant amounts of CH<sub>4</sub> can be emitted during the production of nitrate. Bioenergy production could contribute positively to GHG

FIGURE 14

### The food chain, including inputs, wastages and inefficiencies



Source: Adapted from FAO, 2010h.

emission reduction, although this is currently not always the case. Being energy-smart is therefore a key to climate-smart agriculture.

Energy costs strongly influence several parts of the food system. For example, the significant increase in fertilizer prices between 2005 and 2008 was strongly linked to the soaring price of oil at the time. The effects of high oil prices on low-income rural households and globally on agricultural inputs and farming practices can reduce agricultural productivity, thus exacerbating the pressures to expand the area of cultivated land which, in turn, brings with it the potential risks of increased GHG emissions.

Food security is linked to energy for and from agriculture in many ways. For example, energy is needed to produce and process food but the high cost of fossil fuel-dependent inputs may hinder production increases. Large-scale liquid biofuel development may influence food prices and access to land; food prices may also be heavily influenced by production costs, which are in turn influenced by the cost of fossil fuels for industrial agriculture. All stages of the food chain require energy, be it directly or indirectly, as illustrated in Figure 14.

### Solutions to food-fuel-climate change nexus

The challenges of the food-fuel-climate-change nexus concern energy both for and from agriculture and must be addressed through a combination of measures. These include:

- better energy efficiency, through technological improvements, primarily before the farmgate;
- reducing food wastage, and thus its embedded energy;
- energy substitution, through increased use of renewable energy, including sustainable bioenergy.

**Energy efficiency.** Energy intensity – energy input per food calorie output – is a useful indicator of energy efficiency in food production. Globally, energy intensity in agriculture increased significantly until the mid-1980s, after which it decreased. This has been a crucial and positive change, indicating that in recent years, agriculture has managed to produce more food per energy input.

However, this global trend masks important differences between industrialized/OECD and newly-industrialized developing countries. While both groups have reduced intensity in land use as well as labour requirements, the energy intensity of fertilizers and agricultural machinery has lessened in industrialized countries since the beginning of the 1980s, but has steadily increased in developing countries since 1965. These different dynamics resulted in a reduction of energy intensity in industrialized/OECD countries from the mid-1980s and a significant increase in newly-industrialized developing countries since the 1960s.

In the industrialized/OECD countries, the reduction resulted from a combination of the collapse of high-input agriculture in the former Soviet Union countries in the mid-1980s, a more efficient use of inputs through increased adoption of

precision agriculture<sup>6</sup> starting in the same period, and an increase in the use of low or zero tillage techniques. Precision agriculture technologies often involve significant capital investment, so that even if farmers in developing countries had access to them, they would mostly be too expensive for smallholders and only viable for middle- to large-scale farmers.

In the newly industrialized developing countries, the steady increase in energy intensity has been dominated by high external inputs to farming systems, especially in China and India. However, low external input systems also have their place. They can perform quite well with low external inputs associated with high yields, as when energy inputs come mainly from human or animal labour. In this case, good performance comes from a more integrated use of resources, such as crops and livestock, and using agricultural residues as inputs to the farming system which reduces the need for external and fossil fuel-dependent inputs. Such systems are therefore a valid option for those farmers for whom precision agriculture is out of reach. In fact, it is possible to produce more (food) with less (fossil fuel energy) in farms of all sizes through conservation agriculture, which is an integral part of the sustainable crop production approach promoted by FAO (FAO, 2010h).

***Reduction in food waste.*** Energy embedded in wasted food is significant. For instance, the losses between farmgate and the plate amount to about 2 percent of total annual energy consumption in the USA (Cuéllar and Weber, 2010). Roughly 30 to 40 percent of food from both developed and developing countries is lost to waste, which occurs for a variety of reasons (Godfray *et al.*, 2010), as illustrated in Figure 15.

Food losses in developing countries occur mainly on the farm and in the transport and processing stages. They are attributable to the absence of food chain infrastructure and the lack of knowledge or investment in storage technologies on the farm – hence more related to development constraints.

Food losses in developed countries occur mainly after the retail stage. Reasons include the relative cheapness of food, high food standards which lead to discarding of much edible food, and commercial pressures, such as “buy one get one free” offers.

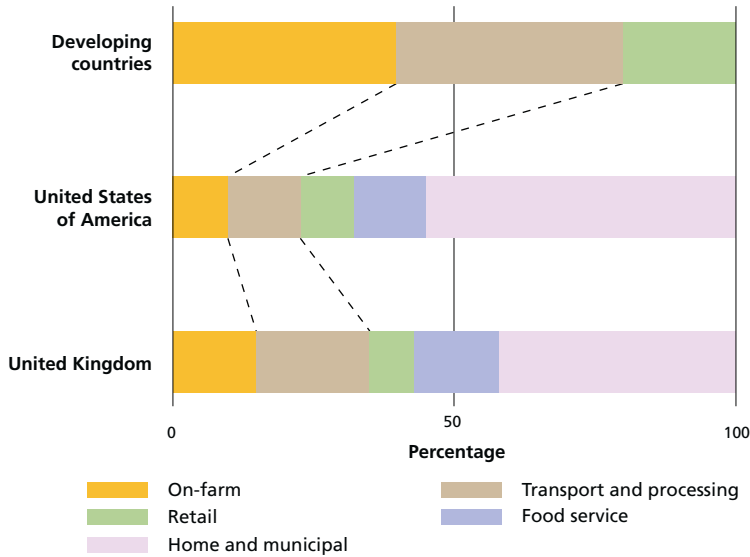
In the USA, on-the-farm energy accounts for only one-fifth of the energy used by the food system, with the other four-fifths arising from transport, processing, packaging, marketing and kitchen preparation. In fact, the most energy intensive segment of the food system is the kitchen, which uses much more energy to refrigerate and prepare the food than was used to produce it. It is not unusual to have more energy used in food packaging than that contained in the food itself (Brown, 2006). Thus, while better food processing and storage facilities can help

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<sup>6</sup> “Precision agriculture” (also called “precision farming” or “site-specific management”) is defined as the application of a holistic management strategy that uses information technology to bring data from multiple sources to bear on decisions associated with agricultural production, marketing, finance and personnel.

FIGURE 15

### Makeup of total food waste in developed and developing countries



Note: Retail and home and municipal categories are combined for developing countries.

Source: Godfray et al., 2010.

avoid losses of food – and the energy embedded in it – they are themselves a significant user of energy.

A 2011 study (Gustavsson, Cederberg and Sonesson, 2011) commissioned by FAO from the Swedish Institute for Food and Biotechnology (SIK), found the following:

- industrialized and developing countries waste roughly the same quantities of food – respectively 670 million and 630 million tonnes;
- consumers in industrialized countries waste almost as much food each year (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes);
- fruits, vegetables, roots and tubers have the highest wastage rates of any food;
- food lost or wasted every year is equivalent to more than half of the world's annual cereals crop (2.3 billion tonnes in 2009/2010).

**Energy substitution – energy from agriculture.** Agriculture has a unique link with energy in that it both consumes and produces energy, the latter through bioenergy. Bioenergy is the oldest type of energy – for example wood for heating and cooking. It currently accounts for about 10 percent of the world's energy mix. Bioenergy is the only renewable source of energy that can replace fossil fuels in all energy markets – heat, electricity and transport. As a result, its share in the future energy mix is predicted to increase substantially – by 25 to 30 percent – according to the latest estimates (IEA Bioenergy, 2010).

Every day, between 2 and 3 billion people rely on solid biomass – wood, charcoal, agricultural residues and animal waste – for cooking and heating. They most often use open fireplaces or traditional cooking stoves which are both extremely inefficient and represent a major threat to health. Some 1.9 million people die annually as a result of exposure to smoke from cooking stoves. Moreover, the heavy dependence on wood for cooking in developing countries can lead to deforestation and forest degradation.

Among the different types of bioenergy, liquid biofuels have been the most controversial. To date, biofuels are the most readily available alternative to fossil fuels in the transport sector – and the only alternative possible for ship transport and aviation. This explains the sharp increase in demand over the last decade – more than a threefold increase for bioethanol and elevenfold for biodiesel (FAO, 2008d). This is despite the fact that in most countries, the best use of biomass for energy is in electricity and heat production. The main concerns regarding liquid biofuels – at least first generation biofuels based on sugar, starch and vegetable oils – relate to their environmental and food security risks, in particular those produced on a large scale. The environmental risks are related to possible biodiversity loss and GHG emissions caused by land conversion. The food security risks are related to possible competition for land between energy and food crops, and to the impact on food prices caused by the diversion of crops to biofuel production. However, as with many agricultural products, recent work by FAO and other organizations with a focus on bioenergy have found that liquid biofuels are not bad or good *per se*: it depends on how they are produced, including production of feedstock, land choice and farming practices, and the logistics of the biofuel supply chain (FAO, 2010i).

Experience in biofuel production has led to harvesting of good practices that minimize risks and harness the opportunities. For example, sound and participatory land-use planning, including agro-ecological zoning to define “no go” and “best bet” areas, can be followed for different feedstock crops. Brazil follows this practice for sugar cane and oil palm. Other good practices include the use of perennial plants on degraded land abandoned by farmers; combined cultivation of energy and food crops through rotations in mixed cropping or agroforestry systems; use of agricul-

**PHOTO 7**

The past decade has witnessed a more than threefold increase in demand for bioethanol and elevenfold for biodiesel.





tural and forestry residues (except those used for soil management and animal feed); contract farming, whereby smallholders supply the feedstock for large processing plants and thus reduce the risks of land displacement; and use of dual-purpose crops that provide both fuel and food, such as sugar cane, cassava or palm oil – associated with policies that prioritize food production where necessary. Brazil and the Democratic Republic of Congo follow this last practice for sugar cane and palm oil, respectively.

### **Integrated food energy systems**

The merits of the integrated food energy systems that apply several of the above-mentioned good practices have been recognized and are being scaled up in two different ways. The first combines food and energy crops on the same plot of land, intercropping trees for fuelwood and charcoal with food crops, as in an agroforestry system. The second uses by-products or residues of one type of product to produce another, such as producing biogas from livestock residues.

There are considerable expectations being placed on advanced biofuels, such as the second generation or lignocellulosic biofuels, and algae-based products that use feedstocks not used for food. Although there has been significant research and development to improve these second generation lignocellulosic biofuels and technologies are emerging, it will still be several years before it reaches a level of large-scale commercial deployment. Algae-based biofuels have a number of interesting characteristics, such as their high biomass productivity, the possibility of using marginal land, saltwater and waste streams as their nutrient supply, and using combustion gas as CO<sub>2</sub> to generate a wide range of fuel and non-fuel products (FAO, 2010j). However, the production costs of both lignocellulosic and algae-based biofuels are still significantly higher than those of traditional biofuels.

In addition to biomass, other types of renewable energy can be used to help agriculture and the food system become less dependent on fossil fuels. For example, wind power has been used for centuries to lift water for irrigation on agricultural land; and solar energy is used to power pumps, heat water, purify water and dry agricultural products. Hybrid systems that combine renewable and fossil energy for decentralized power supply are growing in importance, as they provide a more reliable and continuous energy supply than is possible with renewable energy alone and thus offer good potential for rural development.

Successful implementation of renewable energy initiatives in agriculture is linked to educational, financial, institutional and infrastructural requirements. Microcredit can ensure affordability and facilitate replication and private sector involvement. Inclusive business is another key element of successful applications and strategies, either as a means for end-users to generate income with renewable energy or to deliver technologies and services based on renewable energy to other end-users.

Addressing the food-energy-climate change nexus will undoubtedly be agriculture's greatest challenge this century. Meeting the world's growing demand for food and energy while adapting to – and minimizing the resulting impact on – climate change will require careful consideration of the pressures on land use, fossil fuel



consumption and food security. If it is to achieve this, agriculture will have to become more energy-efficient; food wastage must be minimized throughout the food chain; and the use of sustainable bioenergy and other renewables will need to increase.

## Conclusion

Climate change is expected to affect food production and food distribution systems and infrastructure, particularly in the second half of the century. Agriculture is both a victim of the effects of climate change and a contributor to its causes. For example, agriculture contributes some 13.5 percent of the world's greenhouse gas emissions, and deforestation and forest degradation account for 17 percent more. Agriculture and forestry, however, should also be seen as part of a comprehensive solution to the problem: the inclusion of the agriculture and forestry sectors in mitigation efforts is crucial to keeping the impacts of climate change within limits that society can reasonably tolerate.

FAO policies and activities promote climate-smart agricultural practices such as integrated rice farming systems, conservation agriculture, low-energy use aquaculture, and sustainable forest and land management systems and agroforestry. It supports country efforts in climate change mitigation through advocacy, the generation and dissemination of data, knowledge and technology, and support for institutional structures focused on realizing the mitigation potential of agriculture, forestry and other land-use sectors. Two key climate change programmes through which FAO operates are UN-REDD and the Mitigation of Climate Change in Agriculture (MICCA) project.

## CHAPTER 4

# Managing globalization in the agriculture sector

In today's globalized world, no country stands alone in efforts to ensure sustainable food and nutrition security for its people. No longer can the problems of people on one side of the world be ignored by those on the other. The impacts of shocks caused by climatic disasters, price fluctuations caused by crop losses or overproduction, the effects of transboundary diseases all ripple out and can take a toll on global markets and food supply.

The phenomenon of globalization, or the growing integration of economies and societies around the world because of increased flows of information, capital, labour, technology, goods and services – has integrated economies and societies around the world. Globalization itself is driven by four main factors: market liberalization; growth of international trade; an increase in international financial transactions and capital flows; and advances in information and communication technologies (ICTs) as well as logistics systems.

## International trade and market access

International trade can have a major impact on reducing hunger and poverty in developing countries. Participation in trade allows access to larger markets and opens up opportunities for specialization in production and economies of scale. This can be of special importance for developing countries, particularly for smaller ones where the limited size of domestic markets discourages full use of their production potential. For example, almost 40 percent of global fish production enters international trade, allowing producers to reap the economic benefits from harvest while also contributing to food security by providing consumers access to fish products. For developing countries, this is particularly important. Not only are they responsible for more than 80 percent of total fish production, they are the origin of more than 50 percent of all fish that enters international trade.

At the same time, trade provides access to better and cheaper supplies, including food imports, and may stimulate flows of technology and investment. To the extent that international trade spurs broad-based economic growth, expanded participation in world markets can contribute to improvements in household food security.

However, increased openness to international trade has its costs. It may redistribute world production according to countries' competitive positions in the global markets. Inevitably, this means that certain industries in some countries may shrink, either absolutely or relative to others, as cheaper imports become available.

The resulting changes in the production structure and reallocation of resources may have a negative impact on food security, at least in the short term. Unemployment may rise, some productive sectors in agriculture may decline and the food system may become increasingly concentrated, shutting out small-scale farmers and firms.

Overall, countries that are more involved in trade tend to enjoy higher rates of economic growth. However, growth rates diverge widely for countries with comparable levels of trade activity, highlighting the importance of other factors in determining economic performance. Such factors include natural resource endowments, the size, skills and training of the workforce, and policies and institutions.

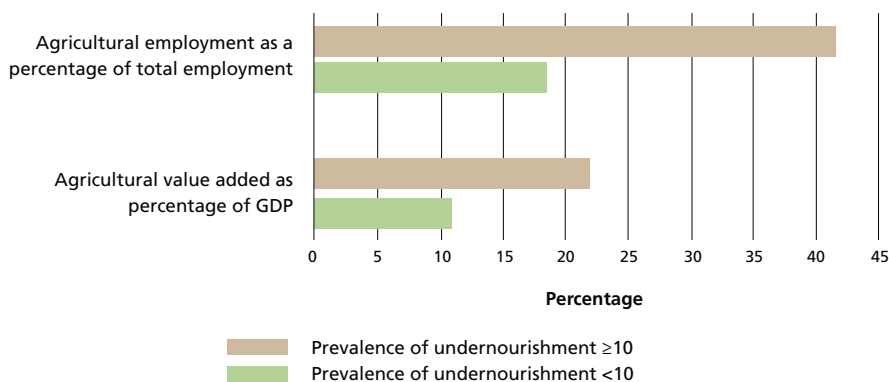
Indeed, while there is broad agreement that openness to international trade is a fundamental component of a policy mix that can foster economic growth, it is also recognized that, on their own, policies designed to open up trade are unlikely to lead to major improvements in a country's economic performance. Moreover, such policies cannot be a substitute for measures specifically aimed at reducing poverty and hunger.

### ■ Agriculture, trade and food security

Agriculture and agricultural trade play a particularly important role in both the national economies and the food security of developing countries. However, the relative importance of the sector is far greater in those countries where hunger is most widespread. In countries where more than 10 percent of the population is undernourished, agriculture represents on average more than 20 percent of GDP and more than 40 percent of total employment (see Figure 16). In more food-secure countries, the shares for agriculture are 11 percent of GDP and 18 percent of agricultural employment. With so many people earning their living and so much income being generated in the agriculture sectors of vulnerable countries, economic growth originating in the sector can have a particularly significant impact on poverty and hunger reduction. Increasing employment and incomes in the agriculture

FIGURE 16

#### Agriculture and undernourishment in developing countries, 2006-2008



## BOX 12

**Narrow export base leaves countries vulnerable**

Many developing countries rely on exports of a small number of agricultural commodities for a large share of their export revenues. In fact, as many as 43 developing countries rely on one single agricultural commodity for more than 20 percent of their total export revenues and more than 50 percent of their revenue from agricultural exports. Most of these countries are in sub-Saharan Africa or Latin America and the Caribbean, and they depend on exports of coffee, bananas, cotton lint or cocoa beans. A high dependence on one, or just a few, export commodities leaves these countries extremely vulnerable to changing market conditions.

sector stimulates demand for non-agricultural goods and services, providing a boost to non-farm rural incomes as well.

Agriculture also accounts for much of the trading activity of developing countries, particularly those that are most food-insecure. For countries where the prevalence of undernourishment is more than 10 percent, agricultural products represent an average of about 26 percent of total merchandise exports. For countries where the prevalence of undernourishment is less than 10 percent, agricultural products represent an average of around 14 percent of total merchandise imports. The fact that agricultural exports represent more than one-quarter of the merchandise exports of vulnerable countries does not imply that agricultural trade contributes to food insecurity.

These countries heavily export agricultural products because agriculture is the mainstay of their economies and they need to import food. Moreover, it is in the countries that are less food-insecure (where the prevalence of undernourishment is less than 10 percent) that agricultural trade looms largest in relation to the scale of their agricultural economies. This reflects the fact that agriculture in these countries is more productive, more competitive and better integrated into world markets, suggesting that more robust agricultural growth can contribute both to reduced hunger and to increased integration in international trade.

Furthermore, poor access and poor integration with international markets limits the ability of countries with widespread hunger to import enough food to compensate for shortfalls in domestic production. Countries where more than 10 percent of the population goes hungry spend more than three times as much of their export earnings to import food than more food-secure countries. However, their poverty and limited trading activities constrict their export earnings as well as their ability to buy more food on international markets. As a result, despite spending more than 40 percent of their export earnings on food imports, food-insecure countries depend far more heavily on homegrown food. Countries where more than 10 percent of the population is hungry import less than 15 percent of

their food, compared with more than 33 percent in more food-secure countries (see Figure 17). Their relative isolation from international trade appears to be more a measure of vulnerability than of self-sufficiency.

It must also be stressed that levels of hunger and poverty also differ widely among countries with very similar levels of agricultural trade. This suggests that the impact of agricultural trade on food security is mediated by a range of other factors, including markets, institutions and policies to combat hunger.

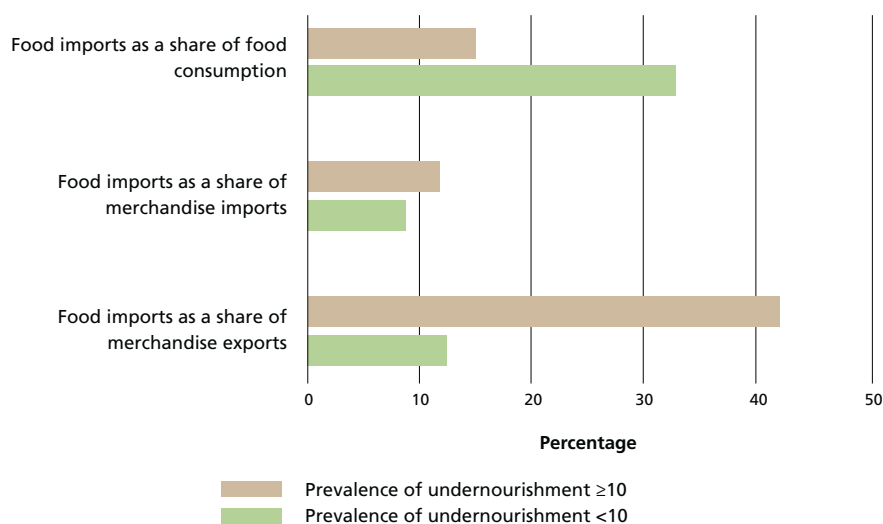
### Establishing a “fair” rules system for agriculture

Despite the importance of agriculture and agricultural trade for developing countries in reducing poverty and hunger, the period leading to the launching of the Uruguay Round of multilateral trade negotiations in 1986 was characterized by the prevalence of production- and trade-distorting policies in a number of developed countries. These policies, put in place in periods of shortage during the 1950s and 1960s, had led to structural surpluses and an excess supply of a number of commodities on the world market. This was to the detriment of other countries, including many developing country exporters. In addition, many developing countries had the opposite problem: underproduction, resulting from their own disincentive policies, designed to extract resources for developing their manufacturing sectors, as well as from the distorted world market environment.

The existence of such policies in both developed and developing countries made it difficult for developing country agriculture to expand sufficiently to avoid the disarray of agricultural commodities in international markets during the 2007–2008 period. A lack of appropriate incentives, caused by direct distortions such as export

FIGURE 17

#### Agriculture and trade in developing countries



## BOX 13

### Defining “fair” trade

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Researchers use three almost identical terms when discussing trade (ITC, 2010): fair trade, Fair Trade and fairtrade.

In international negotiations, **fair trade** is trade conducted according to transparent, non-discriminatory rules, so one exporter does not have an unfair advantage over another. **Fairtrade** is the label of an international community of organizations that belong to Fair Trade Labelling Organizations International (FLO) and apply **Fair Trade** principles.

taxes, and by indirect distortions such as protection of the manufacturing sector, together with overvalued exchange rates and declining investment in agricultural and rural development prior to the 1980s, set the scene for the first global food crisis in more than 40 years.

### Uruguay Round

Multilateral trade negotiations on agriculture began in earnest with the onset of the Uruguay Round, the aim being to reduce such trade barriers and to establish a fairer, rules-based and transparent trading system. The seeds of this round of negotiations were sown in 1982 at a ministerial meeting of the General Agreement on Tariffs and Trade (GATT), the round was launched in Uruguay in 1986 and the relevant agreements were signed in Marrakesh, Morocco, on 15 April 1994. The Agreement on Agriculture (AoA) was an important step in reforming world agriculture. However, although it recognized the political difficulties in bringing agriculture under multilateral disciplines, the mechanisms it put in place left much to be desired, especially from the point of view of food-insecure developing countries.

The AoA, essentially a trade agreement, aims at stemming overproduction and associated trade-distorting policies. The problem of underproduction and associated disincentive policies in many food-insecure developing countries were not, and could not be, addressed by a trade agreement. As the issues under negotiation largely concerned developed country structural imbalances, developing countries did not fully engage in the negotiating processes and many of them signed on to the final agreement as if this had very little to do with their own agriculture sectors. In doing so, they agreed to production-restraining provisions, possibly limiting their policy options to boost domestic production in the future and legitimizing past distortions in developed countries. They also limited their export opportunities in developed country markets in the future.

### Doha Round

These issues still confront many of the developing countries as the agricultural reform process continues under the Doha Development Round (DDR) of multilateral negotiations. The mandate for the DDR negotiations, which began in late-

PHOTO 8

Successful negotiations on fisheries subsidies could discipline the use of subsidies that lead to overcapacity and overfishing.



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2001, is no different than those of previous rounds, but it is now recognized that agriculture is of critical importance to the economic development of developing countries, which must be able to pursue agricultural policies that are supportive of their development goals, poverty reduction strategies and food security and livelihood concerns.

Now a decade into the negotiations, DDR has focused on a “modalities” phase, setting numerical targets and other details for achieving the objectives of the new round and determining the shape of the negotiations’ outcome. The latest draft modalities paper was produced in December 2008.

The difficulty in reaching convergence in the negotiations has been the result of differing views on how best to reduce core distortions while allowing the policy space and flexibilities demanded by various country groups to cater for their own national interests. Although the implementation of the AoA had reduced agricultural market distortions to some extent, its architecture, in terms of specific instrumentation, allowed plenty of room for the developed countries to meet their legal obligations technically, while continuing to pursue the same distorting policies as before – policies for which they have sufficient financial resources. The developing countries, on the other hand, neither have the resources nor enjoy the flexibility to implement such measures. Moreover, there are still many trade barriers in developed country markets, including tariff peaks, tariff escalation and sanitary and phytosanitary measures, which effectively limit market access to developing country exports. If trade is to contribute to food security, these fundamental imbalances and loopholes of the AoA have to be removed.

Many of the policy instruments that could be implemented by vulnerable countries to improve the food security of their populations tend to run counter to the spirit of liberalizing trade. That is one of the important reasons why agreement has been so difficult to reach on many issues in the DDR negotiations.

**Import subsidy.** The most effective instrument for raising agricultural productivity and food production in food-insecure countries is the input subsidy, yet it has been identified as the most production- and trade-distorting among the various support

measures and has been used effectively to reduce overproduction in developed countries. In countries with a large population spending most of its income on food, an input subsidy does not penalize poor consumers, as would be the case with an output support policy, and it provides an incentive to producers by reducing their production costs.

***Safeguard mechanisms.*** Food-insecure countries have been pushing to retain border protection for achieving market stability and maintaining producers' income during times of low international prices, given that they lack the budgetary resources to provide direct support. Although provisions for Special Products and Special Safeguard Mechanisms are envisaged in the DDR, and could be used by vulnerable countries for protecting their vulnerable producers, these have been important obstacles to an agreement being reached in the negotiations. With regard to Special Products, disagreements are about the total number of special products, those requiring no tariff cut, and the tariff reduction rate for other products. With regard to the Special Safeguard Mechanisms, disagreements are about when an import surge calls for protection of the domestic industry, the level of trade remedy measures to be applied when a surge is identified, and the number and frequency of use of the mechanism. Those who propose restrictions in the use of these instruments – mainly the developed and developing agricultural-exporting countries – argue that they could potentially block a significant share of their exports.

Under the AoA, applying export prohibitions, restrictions and export taxation in order to protect consumers against sudden increases in international prices of agricultural commodities, especially food commodities, is technically legal, provided these measures are applied temporarily. Such measures, of course, could put further upward pressure on international prices, as they did during the food and fuel crisis of 2007–2008. However, there is resistance on these issues from some WTO mem-

#### BOX 14

### Fisheries subsidies in the Doha Round

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The mandate of the DDR negotiations specifically calls for clarification and improvement of WTO disciplines on fisheries subsidies, requesting that “appropriate and effective special treatment should be an integral part of the fisheries subsidies negotiations, taking into account the importance of this sector to development priorities, poverty reduction, and livelihood and food security concerns”. Since 2008, FAO has participated in the Rule Group negotiations as an observer, providing technical assistance as necessary and monitoring the role foreseen for FAO in the new fisheries subsidies disciplines. The successful conclusion of the negotiations on fisheries subsidies could discipline the use of subsidies that lead to overcapacity and overfishing which, in turn, would have a positive impact on the state of aquatic resources.



bers and it is unlikely that stronger disciplines on export prohibitions, restrictions and export taxation will materialize from the Doha Round. Beyond the serious food security concerns of net food-importing countries resulting from weak WTO rules in this area, this raises doubts concerning the reliability of the world market as a source of food supplies, and the credibility and impartiality of efforts to reform world agricultural trade.

There are less controversial measures currently being negotiated, which are designed to help food-insecure countries. These include measures on stockholding, domestic food distribution programmes and food aid. Overall, however, the multilateral trading system and the rules that govern it can be helpful at the margin but are not the answer to food-insecurity problems of developing countries. Given the limited capacity of these countries to implement various provisions and take advantage of export opportunities, some differentiation between members of the WTO as regards their rights and obligations may have to be introduced. However, such special and differentiated treatment is not likely to be acceptable to all if it is to be made available across-the-board to all developing countries, since the market effect of such all-encompassing provisions would be large.

### **Private standards**

The multilateral trade negotiations aimed at reducing barriers to trade relate to measures and standards that are implemented by public institutions through an intergovernmental process. Measures and standards applied by private firms remain outside these negotiations. The increasing trend towards the use of “private” standards raises several questions about the increased costs of compliance with demands that go beyond regulatory requirements, the potential anticompetitive behaviour of dominant firms, and private standards as *de facto* non-tariff barriers to trade, particularly for small producers in developing countries (ITC, 2010, p. 7). How such standards could be made transparent and whether a legal framework could be developed for them are issues that remain unexplored. These are important points because, if the trend continues to expand to cover more food commodities, they have the potential of making the “official” negotiations redundant.

## **Large land acquisitions for food exports**

Over the last few years, large-scale acquisitions of farmland in Africa, Latin America and Central and Southeast Asia have made headlines across the world. International investors now actively seek land that previously had little apparent value or interest. These large land acquisitions, often dubbed “land grabs”, are likely to have profound implications for the future of world agriculture and food security, with the potential to reshape the relations between agribusiness and smallholder farming. Exactly how the situation will evolve is still unknown, but it is likely to vary according to local and national contexts.

Precise quantitative assessments of the scale, geography and players in the global move towards large-scale land acquisitions are not yet available. However, some aggregate estimates, to a large extent based on media reports, have been compiled. The figures reported are likely to increase rapidly.

- In May 2009, the International Food Policy Research Institute (IFPRI) estimated that between 15 and 20 million ha of farmland in developing countries had changed hands since 2006 (*The Economist*, 2009).
- In September 2010, on the basis of press reports, the World Bank (Deininger *et al.*, 2010) identified tentative deals and intentions to acquire large land tracts amounting to a total of 42 million ha globally in just the 11 months between October 2008 and August 2009. About three-quarters of these deals (32 million ha) were in sub-Saharan Africa.
- In September 2010, on the basis of a larger number of transactions reported in the press during the previous three years, the International Land Coalition identified 277 recent and current large land transactions in 27 countries, for a global total estimated between 51 and 63 million ha (International Land Coalition, 2010).

The main category of investors include governments or government-backed companies operating with sovereign (state) funds, national private-sector companies, private foreign companies, and asset management funds. On the hosting side (countries receiving investments and supplying land), the main actors are often governments (particularly in Africa and Asia) and the land proposed for investments is state-owned or public land. In Latin America and Eastern Europe, the land targeted for investments is more often the property of private owners.

### ■ The nature of the land deals

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One of the first studies of the major trends and actors involved in land deals found that foreign investments resulting in large-scale land acquisitions in the African region are more significant than domestic investments in the same activity, although these can also play an important role. The study, based on an empirical investigation in six African countries and undertaken by the International Institute for Environment and Development (IIED), FAO and IFAD (Cotula *et al.*, 2009),<sup>7</sup> found that most of the current large-scale land deals have been made by European biofuel investors as well as Gulf State and Asian investors. The private sector has acquired the most land, while government funds and sovereign wealth funds tend to be investing on a smaller scale. However, private investors may receive support from their home country governments, which provide diplomatic and financial support from their development funds to enable companies based in their countries to make the large-scale land investments.

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<sup>7</sup> This publication, as well as some shorter papers by Lorenzo Cotula based (mostly) on the study, provide a large part of the information and analysis summarized in this sub-chapter.

In the majority of cases, the allocations/acquisitions have been made from state lands, and leasing is more common than outright sale of land. Lease terms can be up to 99 years, with annual charges paid by investors generally low – a maximum of US\$12 per ha per year. Long-lease arrangements and competitive prices are a way for governments to attract foreign investors. In return, governments seek benefits in the form of new jobs, technology transfers, foreign currency and infrastructure development.

### **Factors underpinning land deals**

There are a number of factors determining the recent surge in land investment. They include business opportunities linked to expectations of rising food prices and land values, the biofuel boom which has driven the interest in access to large tracts of land to grow feedstock, industrial demand for agricultural commodities, water shortages and the impact of climate change in home countries, and policy reforms designed to attract foreign direct investment (FDI) in recipient countries. This global picture of trends and drivers makes it difficult to distinguish the impact of land acquisitions for food exports from impacts driven by other anticipations and objectives.

*Food security of the investor countries* is one of the key drivers of the land investments. Investor country concern about food security burgeoned during the food price hikes of 2007–2008. Importing food through outsourced agricultural production, rather than depending on the world food market, perceived as costly and unpredictable, is seen as a way of securing food security for growing populations and heading off future social unrest associated with food supply difficulties, such as those that affected 33 countries during the 2007–2008 food price spikes.

*Rising food prices* make agriculture an increasingly attractive investment option. In recent decades, agricultural value chains have tended to concentrate on food processing and distribution. This has left the risks mainly in primary production, which has acted as a disincentive for investment in agriculture. Now the upward trend in commodity prices is tipping the balance by increasing the downstream risks to processors and distributors who are concerned about sourcing raw materials and boosting returns from production. This increases the attractiveness of agricultural production as an investment option, not only the acquisition of land itself, but also acquisition of shares in companies holding land, producing fertilizers, providing management services or otherwise involved in upstream agricultural activities.

*Improved prospects for returns from agriculture* also encourage speculative investment in land, especially after the global financial crisis resulted in a massive injection of liquidity and a collapse in equity and bond markets, thus precipitating a resurgence of interest in land and commodities (UNCTAD, 2009).

Food production for export through global commodity markets or through direct agreements between investors and host governments appears to be a major new



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**PHOTO 9**

The impacts of land acquisition are likely to differ depending on the context and business model.

trend and central component in the current wave of large-scale international agricultural investments and land acquisitions. Nevertheless, the current wave of land acquisitions is still too recent to permit detailed evidence-based assessments of impacts and outcomes, positive or negative, on the livelihoods of affected countries and communities. These impacts are likely to differ according to contexts and to the types and business models of investments. Large-scale mechanized farming is likely to have different impacts on livelihoods and income distribution than contract farming which promotes smallholders' progress and improvement.

Although these deals held promise of financial investment, employment, technology transfers and income generation, evidence is scant as to whether the promise has been fulfilled. One challenge in assessing the impacts is that large-scale foreign deals are often part of a wider package of proposed bilateral development assistance that could include, for example, investment in large-scale infrastructure, such as ports or hydro-electric schemes. Any assessment of impacts, therefore, would need to consider the wider and longer-term impacts on the countries concerned.

For now, the empirical case studies present a mixed picture. Some conclude that at least some large-scale acquisitions have not lived up to expectations and, instead, have had a negative impact. Others show evidence that some foreign investments in agriculture are having a positive impact. More well-documented research on impacts, both positive and negative, is needed.

### **Opportunities and risks in land acquisition**

There may be both risks and opportunities for those on the receiving end of large-scale land acquisitions. Increased investments may bring macro-level benefits, such as economic growth and improved government revenues, and may create opportunities for economic development and improvement in livelihoods in rural areas. However, as governments or markets make land available to prospective investors, large-scale land acquisitions also may result in local people losing access to the resources on which they depend for their food security – a particularly important issue as some key recipient countries may themselves face food security challenges. Studies by IIED, FAO and IFAD indicate that local people are likely to be under-

mined and left without secure rights to use state-owned land. They also indicate inaccessible registration procedures, legislative gaps and limited, if any, compensation for loss of land and sources of revenue.<sup>8</sup>

***Factoring in rural development.*** Given their scale and locations, these investment deals need to address rural development and how the majority of the rural poor affected by the acquisition can benefit from the generation of diversified employment opportunities, support for the small-scale farming sector and community benefits resulting from a wider distribution of incomes generated. If large-scale land acquisitions and investments do not benefit the majority of small-scale farmers and pastoralists affected, they might easily become unsustainable, creating social unrest, mass migration and political instability. This requires careful design of large-scale land acquisitions and investments in land, because ensuring complementarity between large-scale investments and the small-scale farming sector will increase the potential to generate more income and wider employment.

***Balancing opportunities and risks.*** Ultimately, the extent to which international land deals seize opportunities and mitigate risks depends on their terms and conditions. A number of points need to be addressed in this context:

- how the risks are to be assessed and mitigated, e.g. through project design and location considerations;
- which business models are to be favoured in project implementation, e.g. models range from large-scale (often mechanized) plantations to contract farming, purchase agreements, policy incentives and joint ventures;
- how costs and benefits are to be shared, e.g. in terms of safeguards against arbitrary land takings or revenue-sharing arrangements;
- how compensations are to be valued for lost resources and livelihoods, e.g. in the event of the displacement and resettlement of populations;
- how compensations are actually provided to the affected populations; and
- the players in decision-making and the consultation processes involved.

The trend of large-scale agricultural investments requires more attention at the global level. Time should be taken in negotiating contracts to ensure transparent agreements that take long-term public interest into account, including negotiating land allocations with local communities and including them in the new initiatives. The local population should be aware that the investments are both useful for their livelihoods and beneficial for local development.

There is a long way to go before achieving these objectives. Many countries do not have legal or procedural mechanisms in place to protect local rights, be they formal or informal. Local interests, livelihood patterns and welfare are often not taken into account when contracts are signed with outside investors. Land deals are too often characterized by a lack of transparency, which creates opportunities

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<sup>8</sup> This paragraph is based on Cotula *et al.*, 2009.



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PHOTO 10

Local interests, livelihood patterns and welfare must be taken into account when contracts are signed with outside investors.

for corruption. Such contracts tend not to maximize the public interest, and the first people to be affected are generally the rural poor.

### Identifying and addressing the challenges

FAO is engaged in two major global initiatives that should contribute to identifying and addressing the challenges of ensuring that large-scale land investments and acquisitions are beneficial for rural development and food security, and for investor countries as well as land-supplying countries. These initiatives are the *Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources* and the *Principles for Responsible Agricultural Investment*. Although different and separate, the two initiatives are strongly complementary.

***Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources.*** The objective of this initiative is to produce an international instrument that gives practical guidance to the private sector, states and civil society, setting out principles and internationally accepted standards and practices for responsible governance of tenure. In leading this initiative, FAO recognizes the importance of engaging with investors and recipient governments, the private sector and civil society to ensure that large-scale land transfers maximize the contribution of the investment to sustainable development, benefiting both investor and host countries, and both large investors and smallholder farmers (who make up the majority of rural people). This may include supporting policy reform in recipient countries towards greater transparency in decision-making and greater consideration of social and environmental issues.

When finalized, the Voluntary Guidelines will provide a framework and a point of reference to which stakeholders can refer when developing their own strategies, policies and activities in the land sector. The Guidelines will also enable governments, the private sector, civil society and citizens to evaluate and improve their governance of land tenure and other natural resources.

This initiative does not target the phenomenon of large-scale land deals. However, by stimulating the transparency and effectiveness of land institutions and land

tenure practices, the Voluntary Guidelines are likely to improve the way in which such transactions are assessed, negotiated, and implemented, both directly and indirectly.

***Principles for Responsible Agricultural Investment.*** With a goal of developing a set of principles that respect rights, livelihoods and resources, FAO, the World Bank, the United Nations Conference on Trade and Development (UNCTAD) and IFAD have based their work on detailed research into the nature, extent and impacts of foreign investment and best practices in law and policy. The principles are intended to distil and encapsulate the lessons learned through this research. They also build on existing international commitments such as the *Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security*. The Principles aim to provide a framework to which national regulations, international investment agreements, global corporate social responsibility initiatives and individual investment contracts might refer. Since 2010, FAO has held a number of international consultations on the Principles, including during its regional conferences. In October 2010, CFS initiated an inclusive process of consideration of the Principles among its members.

## **Engaging the private sector in food security and sustainable development**

There is growing appreciation of the contributions that agricultural companies can make to enhancing food security and supporting the transition to more productive and sustainable food production and supply systems. As FAO addresses the challenges of the twenty-first century, it recognizes that these companies have the capacity to provide agricultural inputs in an efficient and cost-effective manner and, at the same time, contribute to sustainability, food security and value addition by providing a market for farm produce. Today, agricultural companies work with farmers across the globe and play a key role in implementing programmes to support them. Their activities have potentially significant impacts on FAO's efforts to help countries achieve food security and sustainable agricultural development.

Consequently, FAO collaborates and consults regularly with agricultural companies and their associations in many initiatives at national, regional and global levels. Historically, FAO collaborated primarily with non-profit associations that represented the interests of agricultural companies, creating opportunities for representatives of these associations to participate in official meetings and multi-stakeholder consultations much more than it did with the individual companies and business leaders.

As it looks to the future, FAO is now extending its partnering strategy with the private sector, giving increased attention to dialogue with agricultural companies and business leaders and to integrated, multi-stakeholder, long-term strategic approaches that would otherwise be beyond its reach and that of its member coun-



tries. Four important sets of circumstances have led FAO to review and adjust its strategies and approaches for partnering with the private sector:

- *Market changes.* Dramatic and rapid changes are occurring in global food markets and food supply systems, many of them driven by global and national agricultural companies as well as by alliances initiated by associations such as GlobalGAP. FAO's Committee on Agriculture (COAG) called on FAO to help member countries respond to the "challenges of agribusiness and agro-industries development" during its 20th Session in 2007 (FAO, 2007a).
- *Member country requests.* FAO member countries have shown a strong interest in engaging the private sector in country-level policies and programmes to support agricultural development and they recognize the importance of the sector in their food security plans. COAG in 2009 considered issues related to "engaging the private sector in agricultural development" and requested FAO to reinforce capacities for partnering with the sector (FAO, 2009g).
- *FAO strategies.* An external evaluation, conducted in 2006–07, and its follow-up plan of action called for developing new approaches for partnership with the private sector (FAO, 2008e). FAO's new *Strategic Framework 2010–2019* calls for broadening the base of governance "to give full recognition to the roles and interests of the private sector, NGOs, regional economic organizations, regional development banks and other agencies" (FAO, 2009h).
- *Private sector transformation.* Many business leaders and companies have demonstrated that they are committed to developing sustainable food value chains through their own business operations as well as through partnerships, and they have also developed proactive procedures to reduce waste along the food value chain from farm to consumer and to improve the quality and nutritional value of products. While some companies clearly have a large-farm bias, a growing number of companies are adopting policies for working with smaller and medium-scale agricultural enterprises, including input suppliers, food manufacturers, distributors and retailers, in order to develop locally adapted solutions.

## ■ Governance and standard setting

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Most of FAO's governance and standard-setting work is conducted through statutory bodies or commissions, many of them operating under joint oversight with other UN agencies. Generally these bodies and commissions are intergovernmental and only governments are members. However, all allow participation of other stakeholders as observers, including representatives of agricultural companies. Such companies are generally represented by their trade or industry associations rather than participating individually, but company personnel often attend meetings as representatives of their industry associations.

Although the official role of agricultural companies has been limited in the governance and standard-setting activities of FAO, there has been a general trend towards more substantive involvement of non-governmental stakeholders, with



some bodies now establishing formal advisory or consultative mechanisms including agricultural companies through their associations. The following list illustrates the diversity of approaches.

- *The Codex Alimentarius Commission and the FAO Committee on Commodity Problems* address issues that have a significant impact on agricultural companies, and they are affected by the actions of those companies. Membership of both bodies is limited to governments but non-profit industry associations are permitted to participate as observers.
- *The Committee for World Food Security (CFS)* includes non-governmental stakeholders as observers only, but it has recently been taking steps to enhance the opportunity for these stakeholders to have more substantive roles. In 2009, the CFS established an Advisory Group comprising five stakeholder categories, one of which is private sector associations and philanthropic foundations.
- *The International Code of Conduct on the Distribution and Use of Pesticides* contains provisions specifically targeted at the pesticide and food industries. Although associations representing these industries have only had observer status, the Code states that the “pesticide industry is invited to provide reports to the Director-General of FAO on its product stewardship activities related to observance of the Code.”
- *The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* includes a Chemical Review Committee in its implementation mechanism. The global trade association “CropLife International” participates regularly as an observer to represent industry interests. Under the auspices of CropLife, staff from companies such as Syngenta, Dupont Crop Protection, Bayer CropScience, and Dow Agrosiences have participated in committee meetings.
- *Advisory Committee on Paper and Wood Products* is a statutory body of FAO, established to advise FAO on issues faced by the industry and to provide a mechanism for direct communication between FAO and the private sector. The committee includes senior executives of companies or associations from all regions of the world, representing around 90 percent of the global pulp and paper industries sector.

### ■ FAO private-sector partnering strategy

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FAO has undertaken a fundamental review of its partnership strategy, including modalities and priorities for partnering with the private sector. The strategy for optimizing the roles of the private sector in food security and sustainable development now recognizes the value of directly engaging agricultural companies and business leaders at the global and national levels.

To reinforce and mainstream new ways of partnering with agricultural companies and business leaders, FAO also has put together a roadmap for engagement with the private sector envisaging, among other activities, a new strategy for private-



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**PHOTO 11**

FAO has long-standing, productive working relationships with several industry associations.

sector collaboration, renewed principles and guidelines for cooperation with the sector, risk management and due diligence procedures, and monitoring and evaluations tools. This updated strategy, considered by FAO's Programme Committee in early 2011, gives an overview of building principles, criteria for selecting partners and the types of partnering activities, focusing on development and technical programmes, norms and standard-setting work and policy dialogue.

### **Partnering with industry organizations**

At the regional and global levels, FAO has had long-standing, productive working relationships with several industry associations, such as the International Fertilizer Association, the International Seed Testing Association, the International Seed Federation, the Asia and Pacific Seed Association, the African Seed Trade Association, the International Feed Industry Federation and the International Dairy Federation.

At the national level, FAO has worked with companies and producer organizations to help develop and strengthen associations that are specific to a commodity, location, industry or profession. Such associations and organizations have valuable roles in connecting producers and clients, crystallizing and expressing the viewpoints of affinity groups, taking collective action, facilitating networking among members and linkages with other enterprises and organizations, and providing training, information, technology and legal support.

### **Partnering in field programmes**

In its field programme, FAO regularly collaborates with companies, commercial service providers and private-sector associations (including producer organizations) on value chain and subsectoral development projects. FAO offers strong support to innovation in pro-poor business models with particular attention to the producer-buyer relationship. This involves working directly with business managers to carry out business appraisals, develop strategies and prepare plans to improve competitiveness while strengthening procurement ties with small-scale producers. Working on both sides of the producer-buyer relationship, FAO has

helped identify and promote technologies, including inter-firm technologies, to raise productivity and to improve logistics, cold storage, traceability and product safety.

FAO regularly partners with local fertilizer, seed and other companies in developing strategies and carrying out actions to improve the efficiency of input supply and distribution, while also enhancing access for small farmers. In addition, FAO collaborates with agricultural companies in identifying and promoting technologies and business practices to improve efficiency and reduce losses in food processing and distribution, and to introduce food quality and safety management systems.

### Recent FAO initiatives

In recent years, FAO has become more proactive in direct engagement with agricultural companies and business leaders while exercising caution in engagements that could be construed as compromising FAO integrity and neutrality.

Two global initiatives organized by FAO are particularly noteworthy:

- *The Global Agro-Industries Forum (GAIF)*, organized in 2008 by FAO in partnership with UNIDO and IFAD and hosted by the Government of India in New Delhi. GAIF was attended by about 100 countries and included 12 roundtables for executive forum dialogue on strategies and actions to improve competitiveness and development impacts. Business leaders from all regions were invited to discuss their experiences and company strategies. The global event was followed by regional fora in Latin America and Asia, and a High-Level Conference on African Agribusiness and Agro-Industries Development.
- *A meeting of business leaders*, organized by FAO in 2009 in partnership with Milan Expo 2015 was a prelude event to the World Summit on Food Security.

#### BOX 15

### World Banana Forum

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The World Banana Forum, one of FAO's first initiatives to establish a formal mechanism for sustained engagement with agricultural companies, brings together a wide range of stakeholders in the global banana sector, including producer organizations, trade unions, cooperatives, exporter groups, trading companies and retailers, as well as public agencies, governments, research institutions and civil society organizations. Launched by FAO with ILO and UNCTAD in December 2009, the forum promotes and supports dialogue and collaboration, and specifically seeks to enhance the social, economic and environmental sustainability of banana production and supply systems. It provides FAO with a continuing mechanism to communicate and collaborate with senior managers of leading banana producing and export companies.

During the meeting, business leaders discussed their initiatives for addressing food security and sustainable development. An important outcome was a statement on “Private Sector Actions to Reduce Food Insecurity”.

The Director-General of FAO participated in both the GAIF and the Milan private-sector meetings and has followed up in discussions with business leaders to discuss opportunities for partnerships to promote sustainable business practices and food security.

FAO has convened a series of workshops and roundtables in its efforts to engage agricultural companies and business leaders in the technical work of FAO. In 2009, FAO convened an expert meeting for representatives of input industry associations in order to identify actions to improve agricultural inputs supply, as a follow-up to the 2008 High-Level Conference. Starting in 2010, FAO organized a series of regional agribusiness roundtables, involving business managers of small and medium-sized agricultural enterprises (SMAEs) who identified specific regional constraints on SMAE competitiveness. They also shared experiences on how they have sustained procurement from small farmers, introduced quality and safety management systems, developed branded and certified products, and improved logistics and operational efficiency.

### **Partnerships: agricultural company initiatives**

As FAO has started to engage more directly with agricultural companies, it has become clear that many business leaders share concerns about future food security and sustainable development, are convinced that the private sector has an obligation to work effectively as a partner with governmental and non-governmental organizations in ensuring food security, and believe that there are sound business reasons for creating shared global and national agricultural value chains. These business leaders can and do influence their peers and can be instrumental in reshaping behaviour and commitment to food security and sustainable agricultural development.

Complementing its own initiatives, FAO has increased its participation in and support of initiatives launched by agricultural companies and business leaders themselves to promote and support sustainable and inclusive agricultural development. For example, the Sustainable Food Laboratory (SFL), a 2004 initiative of the Kellogg Foundation and Unilever, now has 70 members, mainly private sector businesses. The Sustainable Agriculture Initiative (SAI) Platform was founded by a coalition of leading global companies to promote agricultural practices and agricultural production systems that support sustainable agriculture. Both initiatives support dialogue and “learning from the field” concerning how to build sustainable and inclusive global value chains. FAO has designated representatives both for the SFL and SAI Platform, and it has held discussions on opportunities for enhancing collaboration.

Many companies such as Pioneer Hybrid, Bunge, Syngenta and Tetra Pak, have specific programmes to support sustainable and inclusive agricultural development. Representatives of these companies have been invited to FAO to discuss collabora-

tion. Yara International, Carrefour and other companies have been drivers behind corridor development in Mozambique and Tanzania, and FAO is actively supporting the Southern Agricultural Growth Corridor of Tanzania partnership.

A “New Vision for Agriculture” was developed under the auspices of the World Economic Forum between 2008 and 2010, through dialogue involving business leaders and representatives of the public and non-profit sectors. The New Vision defines joint priorities and makes recommendations on how to leverage public- and private-sector investment for agricultural growth, encourage best practices for the management of natural resources and drive inclusive agriculture sector development. In early 2011, FAO and the World Economic Forum (WEF) agreed in principle to develop a framework cooperation agreement that would systematize dialogue and collaboration in support of the New Vision for Agriculture.

These initiatives by agricultural companies have greatly expanded opportunities for FAO and its private-sector partners to develop and achieve shared vision, values and objectives related to food security and sustainable agriculture sector development.

## Investing in agriculture

Countries that have attained high economic growth, managing at the same time to reduce poverty and the prevalence of undernourishment in their population, have often done so by achieving relatively higher growth in their agriculture sector. A sound policy environment, absence of conflict, good governance and functioning markets, including global integration, have been common elements among these high agricultural growth economies, as well as public investment in rural infrastructure.

### ■ Benefits of agriculture-based growth

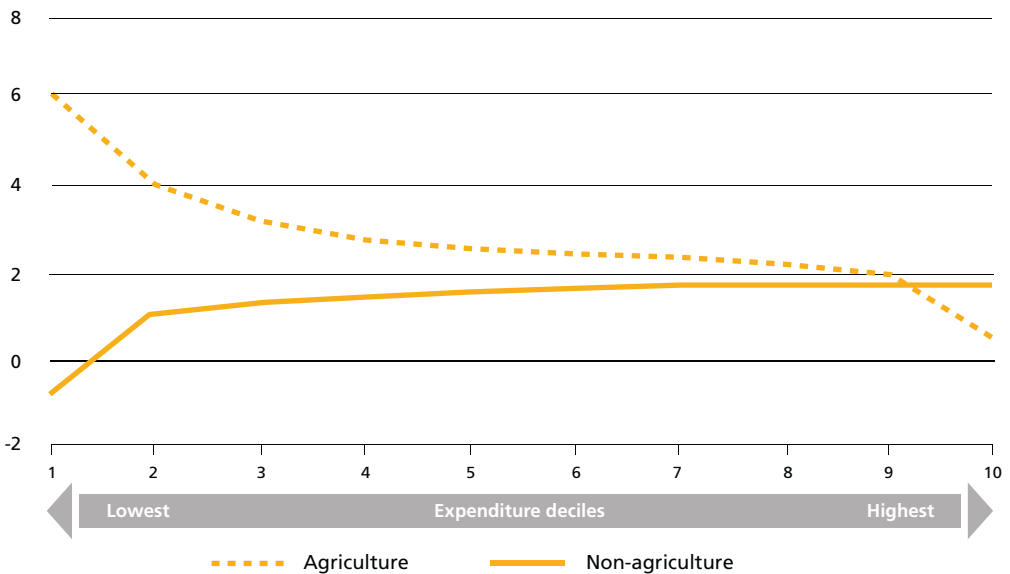
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Government expenditure on agriculture is strongly correlated with capital formation in the sector, as it creates an enabling environment for private investment in terms of infrastructure and sustainable access to natural resources. There is sound evidence that agricultural growth is at least twice as effective in reducing poverty as GDP growth originating outside the agriculture sector (see Figure 18 and Box 16). In addition, the benefits of increasing agricultural production run well beyond direct benefits to millions of smallholder farmers. It extends to other positive factors such as increased food availability, reduced food prices and higher employment in both rural and urban environments as a result of input service provision and value addition along food processing chains.

In developing countries, increased agricultural productivity is central to economic growth and poverty reduction, particularly through its flow-on effect to higher wage job creation outside the agriculture sector. Yet with current population growth, worldwide demand for food is expected to increase by 70 percent by 2050 (and to double in developing countries). Long-term food commodity price increases can

FIGURE 18

## GDP growth originating in agriculture benefits the poorest

Expenditure gains induced by 1% GDP growth  
(Percentage)

Source: Ligon and Sadoulet, 2007.

## BOX 16

## Agricultural investment proven to reduce poverty

In China, following market liberalization and the introduction of the household responsibility system, agricultural growth was 3.5 times more effective in poverty reduction compared to GDP growth from outside the sector; in Latin America, agricultural growth was 2.7 times more effective in poverty reduction. More recently, in Ghana, steeply declining poverty has been attributed to strong agricultural growth.

Agricultural development, therefore, is a critical means for achieving MDG 1, which calls for reducing the proportion of people suffering from extreme poverty and hunger by half by 2015. That challenge is particularly acute in countries with agriculture-based economies, such as sub-Saharan Africa, but also in transforming economies in South and East Asia and the Near East and North Africa, where agriculture is no longer a major source of economic growth, but poverty remains overwhelmingly rural (82 percent of all poor).

therefore be expected, considering supply-side constraints such as land and water scarcity, underinvestment in rural infrastructure and agricultural innovation, a growing urban population and increased production risk linked to global warming.

While higher commodity prices offer opportunities for agriculture, those opportunities are not equally shared. For smallholder farmers to enjoy the benefit of rising prices, they must overcome a myriad of constraints and risks, typified by weak rural infrastructure and market linkages, and poor access to factors of production, including credit, agricultural inputs and knowledge. These constraints are exacerbated by degraded natural resource bases, the productivity-sapping impacts of HIV/AIDS, and new risks posed by climate change.

Agriculture is a strong option for spurring growth, overcoming poverty and enhancing food security, and growth in agricultural productivity is vital for stimulating growth in other parts of the economy. In sub-Saharan African agriculture-based economies, accelerated growth requires a sharp productivity increase in smallholder farming, combined with more effective support to the millions of subsistence farmers, many of whom are in remote areas. In Asia, overcoming widespread poverty in transforming economies requires further diversification into labour-intensive, high-value agriculture linked to a dynamic non-farm rural sector (World Bank, 2008).

### ■ Declining government spending on agriculture

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It is clear that agricultural growth has a significant role to play in reducing poverty and hunger and it is also clear that growth in developing countries' agriculture sectors will not occur without significant public and private investments. Yet, over the past two decades, both domestic and foreign investments in agriculture have been in a state of decline.

Many agriculture-based countries still deliver low per capita agricultural growth and have not implemented the structural reforms necessary for higher agricultural productivity. Too many countries are inclined to implement policies and investment programmes that focus on urban interests at the expense of rural growth. Dependence on food aid frequently undermines investments in agricultural productivity growth and, in turn, the improvement in food security that would come from rising farm incomes. In addition, women, who typically account for the major part of smallholder farm labour, have uneven access to agricultural production factors such as land, inputs and knowledge, which also constrains agriculture-led growth.

This pattern is frequently reflected in domestic public expenditure for agriculture, which has generally been in decline since 1980, both in agriculture-based economies and in those emerging economies where poverty remains heavily concentrated in rural areas (Table 2). This is particularly noticeable in Africa, where domestic public expenditure in agriculture is well below the 2003 Maputo Declaration target, whereby African Union Heads of State pledged to raise spending on agriculture to 10 percent of national budgets by 2008 in support of the Comprehensive Africa

TABLE 2

Share of total government spending on agriculture

REGION	1980	1990	2000	2007
	Percentage			
Africa	5.9	6.0	5.4	3.5
Asia	7.0	7.1	5.2	5.2
Latin America and Caribbean	6.9	3.6	3.6	1.7
<b>Total</b>	<b>6.8</b>	<b>6.5</b>	<b>4.7</b>	<b>4.2</b>

Source: Fan and Saurkar, 2006.

Agriculture Development Programme (CAADP). To date, fewer than ten countries have achieved the target.

The cost of inadequate attention to agriculture, especially in agriculture-based economies, came into focus with the food crisis of 2007–2008. As shown before and during the crisis, strong government commitment is required to maximize the impact of agricultural development policy and public investment choices on growth in the wider economy and, consequently, on poverty. Governments, with donor support, need to address market failures, particularly those constraining labour-intensive smallholder food production and productivity. They must also create a favourable policy environment for private-sector investment, while focusing public investment on areas and commodities with high growth potential and strong forward and backward linkages to the wider economy. For many countries this will mean a focus on their rapidly growing domestic food markets. Countries must also ensure that social protection programmes effectively target the chronically poor and vulnerable, stimulate local growth and reduce risks faced by poor investors (DFID, 2005).

### Official development assistance

Official Development Assistance (ODA) is an important source of public-sector investment for agriculture growth. However, it typically forms only about 15 percent of total public expenditure in the sector, the majority of public investment coming from national accounts. ODA to agriculture in developing countries has declined since the late 1980s. At the same time, several studies have shown that the level of national public spending on agriculture and rural areas also fell during the 1990s and early 2000s.

Over a 20-year period starting in the mid-1980s, ODA fell by 43 percent (Table 3) in constant 2007 prices. In 2007–2008, average bilateral aid commitments to agriculture from countries of the OECD's Development Assistance Committee (DAC) amounted to US\$4.7 billion. Taking into account multilateral development financing agencies, the total was US\$7.2 billion. When aid for rural development and food aid are factored in, the total rises to US\$12.3 billion. On a more positive note, recent trends indicate a slowdown in the decline in ODA to agriculture (Table 4), and even the prospect of an upward trend: over the period 2003–2008, bilateral aid to agriculture increased at an average annual rate of 13 percent (in real terms). If



TABLE 3

Aid to agriculture and food security-related sectors, 2003-2008\*

DAC countries	2003-04	2005-06	2007-08
Agriculture/Forestry/Fisheries	2 763	3 388	4 713
Rural development	622	729	776
Developmental food aid	1 358	1 053	1 204
Emergency food aid	1 976	2 131	2 284
<b>Total DAC countries</b>	<b>6 719</b>	<b>7 301</b>	<b>8 977</b>
Multilateral agencies	2003-04	2005-06	2007-08
Agriculture/Forestry/Fisheries	2 308	1 961	2 521
Rural development	253	216	224
Developmental food aid	823	1 159	393
Emergency food aid	109	180	157
<b>Total multilateral agencies</b>	<b>3 493</b>	<b>3 516</b>	<b>3 295</b>
<b>Total DAC countries and multilateral agencies</b>	<b>10 212</b>	<b>10 817</b>	<b>12 272</b>
<b>Percent Agriculture/Forestry/Fisheries</b>	<b>49.66</b>	<b>49.45</b>	<b>58.95</b>

\*Annual average commitments in US\$ million, constant 2007 prices.

Source: OECD, 2010a.

TABLE 4

Aid to agriculture as a percentage of total ODA

	2003	2004	2005	2006	2007	2008	2009
	<i>US\$ million*</i>						
ODA to Agriculture, Forestry, Fisheries	3 578	4 498	4 718	4 716	6 714	7 586	9 776
<b>Total ODA</b>	<b>90 294</b>	<b>100 907</b>	<b>122 020</b>	<b>127 240</b>	<b>132 965</b>	<b>157 019</b>	<b>151 599</b>
	<i>Percentage</i>						
Agriculture as percentage of total ODA	3.96	4.46	3.87	3.71	5.05	4.83	6.45

\*Current prices 2003-2009.

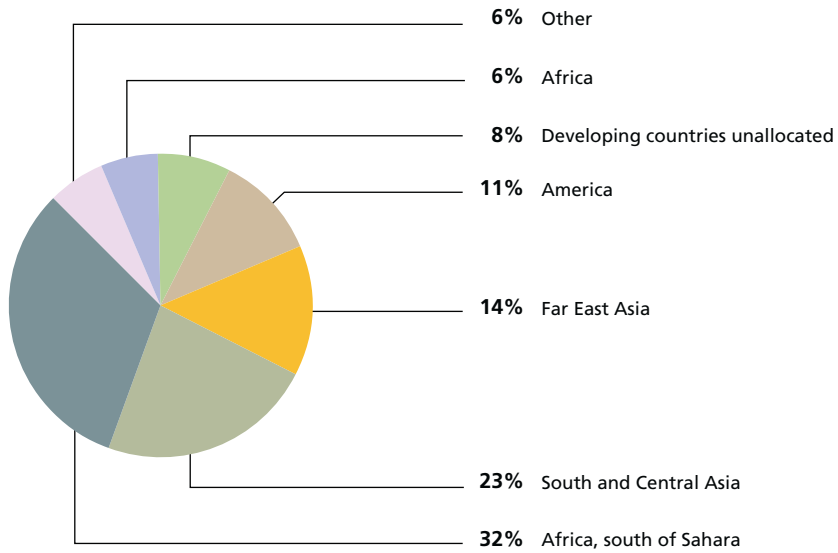
Source: OECD, 2010a.

delivered, recent G-8 and G-20 commitments, most notably the L'Aquila Food Security Initiative, also hold promise for continuing these recent positive trends.

Development assistance flows to agriculture have primarily targeted sub-Saharan Africa (31 percent) and South and Central Asia (22 percent). For both these regions, the share has increased over the last decade, from 27 percent in 1998-1999 to 31 percent in 2007-2008 for sub-Saharan Africa, and from 19 percent to 21 percent for South and Central Asia. Least-developed and other low-income countries received more than half of total aid to agriculture (excluding regional/multi-country aid that cannot be allocated to income groups) (OECD, 2010a).

FIGURE 19

## Regional breakdown of aid to agriculture\*

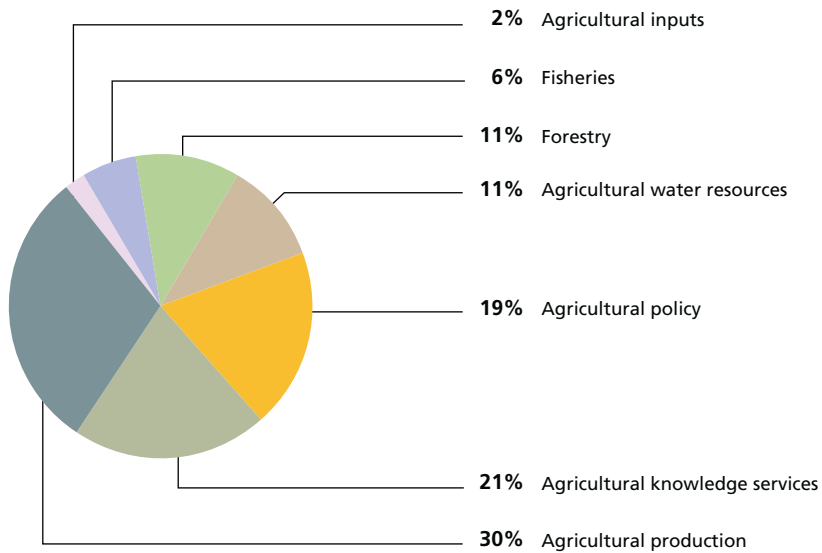


\* Commitments in 2003-2008, constant 2007 prices.

Source: OECD, 2010a.

FIGURE 20

## Subsectoral breakdown of aid to agriculture\*



\* Commitments in 2007-2008, constant 2007 prices.

Source: OECD, 2010a.

**BOX 17****Investment in aquaculture**

Evidence suggests that for aquaculture to develop effectively in sub-Saharan Africa, development efforts must be focused, targeting small- and medium-scale enterprises for production and service delivery in high-potential zones while also developing policies to entice the emergence and expansion of large-scale competitive enterprises. Such efforts require sizeable investment bank loans, which are often lacking, especially for small- and medium-scale farmers. Difficult access to bank loans arises from a lack of collateral, excessively high interest rates on loans, and bankers' perceptions that aquaculture carries a particularly high risk of failure. Farmers lack access to information on the modalities of applying for loans, and lenders have limited information on commercially successful aquaculture enterprises in the region.

To lessen this problem, borrowers need to be able to formulate and present their business proposals in a precise and concise manner that offers the lender a comprehensive picture of the proposed business, communicates how they expect to profit from the proposed enterprises and generate the funds for repayment of the loans sought. The problem of collateral could be eased through "no collateral" strategies such as group lending, village banks and solidarity groups, alternative collaterals such as titled land and moveable property, and through government loan guarantees. When affordable, government loan guarantees and subsidized interest rates could also be used to lessen the problem of high interest rates. It is after improving investments in the sector that aquaculture will effectively grow in the region, creating sizable employment and incomes along the value chain and enhancing food security.

Within the agriculture sector in 2007–2008, ODA flowed primarily to agricultural production (31 percent), agricultural knowledge services (21 percent – including agricultural research and education, plant breeding, plant and animal protection, marketing, credit and farmer organization inputs) and agricultural policy (19 percent – including institutional and capacity development, sector adjustment and natural resource management). Forestry (11 percent) and fisheries (6 percent) were the other main beneficiary subsectors. Support to agricultural inputs, a subject that has received considerable attention recently, formed only a minor component (2 percent) of total ODA.

**Private enterprise and agricultural capital stock**

Without a massive capital input into the agriculture sector in agriculture-based and transforming countries, the world will be unable to meet growing food demand. National public investment must be the primary source of public-sector

TABLE 5

Average annual rates of ACS growth before and after 1990

	1975-1990	1991-2007
	Percentage	
<b>World</b>	<b>1.11</b>	<b>0.50</b>
Developed countries	0.60	0.34
Developing countries	1.66	1.23

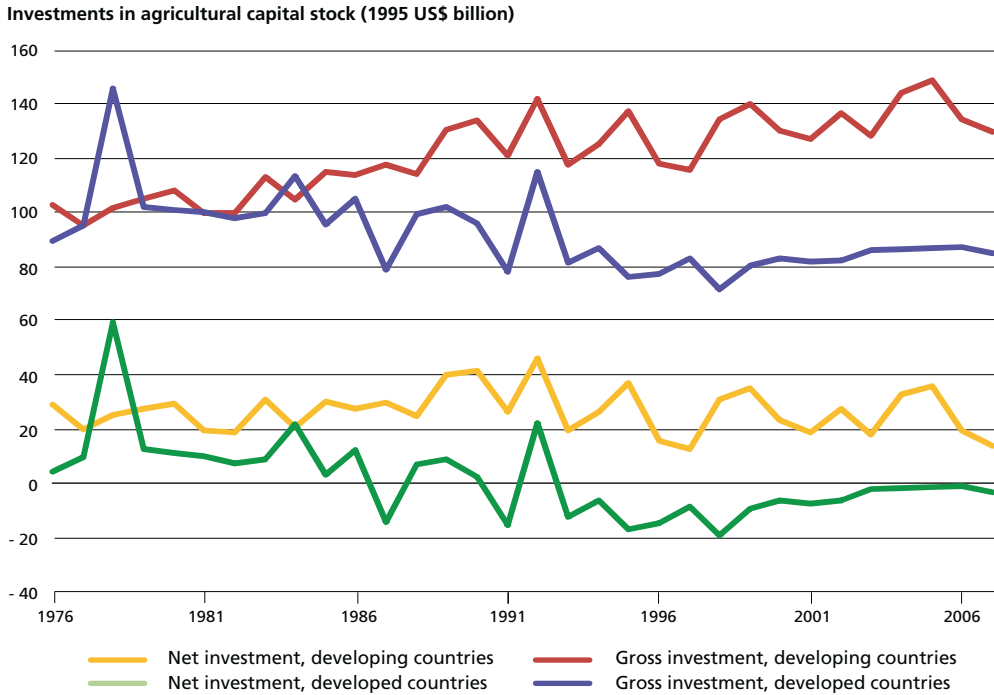
Source: Von Cramon-Taubadel *et al.*, 2009.

development financing, strategically backed by well-targeted ODA. However, globally, agricultural production and marketing is overwhelmingly reliant on private enterprise. Private enterprise in the sector is measured by agricultural capital stock (ACS) – in turn measured by fixed assets in primary agriculture – and this has shown steady growth over the last 30 years, although for most of the period growth has occurred at declining rates (Von Cramon-Taubadel *et al.*, 2009). There has also been a convergence between developing and developed countries, with developing countries showing consistently positive rates of ACS growth across regions and time (although South Asia has recorded a sustained reduction in growth rates since the early 1990s). Worldwide, the average annual ACS growth rate in both developed and developing countries dropped from 1.1 percent between 1975 and 1990 to 0.5 percent between 1991 and 2007 (see Table 5). Disturbingly, ACS growth is lowest in countries with the highest prevalence and depth of hunger. In absolute terms, Von Cramon-Taubadel *et al.* (2009) estimated that gross investment in ACS in developing countries totalled US\$130 billion in 2007 (in 1995 dollars), which is equal to about US\$142 billion in 2009 dollars (see Figure 21).

Importantly, however, the availability of ACS per agricultural worker has outstripped the rate of ACS growth in sub-Saharan Africa and South Asia, leading to average annual reductions in the ACS per worker in agriculture of 0.44 percent and 0.26 percent, respectively, between 1975 and 2007. In the Near East and North Africa as well as in East and Southeast Asia, population growth has eroded but not completely outweighed growth in the ACS, while in Latin America and the Caribbean a declining rural population has led to a rising ACS per worker, which is also consistent with the growth of capital-intensive agriculture in the region. In sub-Saharan Africa, therefore, despite a projected increase of nearly 300 percent in agricultural output by 2050, revenues per person continuing to work in agriculture will not rise significantly, largely because of the expected increase in the agricultural labour force, which is projected to nearly double by then. When combined with the outlook for capital stocks and the land available per agricultural labourer (Table 6), it appears that the poverty reduction potential of the labour-intensive capital-saving forms of small-scale agriculture likely to prevail in sub-Saharan agriculture will be limited by the fact that too many farmers will have to share too few revenues.

FIGURE 21

### Gross and net investments in the agricultural capital stock, developing and developed countries (1976-2007)



Source: Von Cramon-Taubadel et al., 2009.

A provisional analysis (Schmidhuber, Bruinsma and Boedeker, 2009) indicates that investment requirements for primary agriculture and its downstream industries in developing countries over the 44-year period from 2005-07 to 2050 amount to almost US\$9.2 trillion (2009 dollars), 57 percent of which is for primary agriculture and 43 percent for downstream support. Within primary agriculture, about one-

TABLE 6

#### Patterns in agriculture production in sub-Saharan Africa

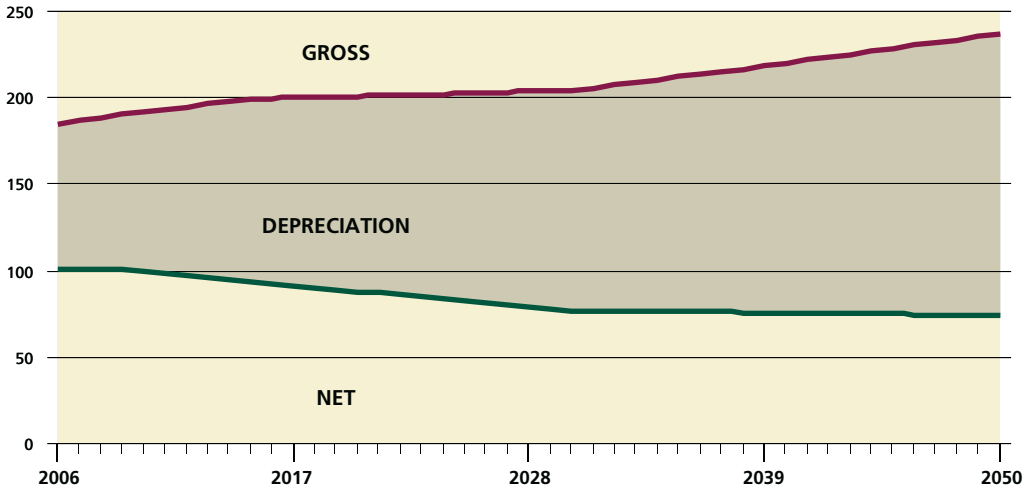
	2005	2030	2050	2050/2005
Agricultural labour force (millions)				
by region	206	310	376	1.83
Capital stock per worker (in 2009 US\$1 000)	2.78	2.62	2.77	1.00
Harvested land per agricultural labourer (hectares)	0.86	0.68	0.63	0.73

Source: Schmidhuber, Bruinsma and Boedeker, 2009.

FIGURE 22

## Total annual investment requirements in developing countries

US\$ billion (2009 prices)



Source: Schmidhuber, Bruinsma and Boedeker, 2009.

quarter of all capital needs are projected to be for mechanization and almost one-fifth (18.5 percent) for the expansion and improvement of irrigation. Some 60 percent, or US\$5.5 trillion, will be needed to replace existing capital, while 40 percent, or US\$3.7 trillion, will be growth investments and thus net additions to existing capital stock. Over time, the share of investment in primary production is expected to fall in relation to investment in downstream value adding. The rates for such change, however, will vary substantially between regions over time, with the higher growth in downstream activities being in sub-Saharan Africa, where food systems are least mature and growth reflects a progressive shift away from a dependence on primary production.

A notable aspect of the study by Schmidhuber, Bruinsma and Boedeker is that annual net additions to the capital stock (growth investments) show a distinct decline over time, falling from about 55 percent of the total in 2006 to just 30 percent in 2050 (Figure 22). This reflects a declining incremental production need as a result of slowing population growth and increased food and fibre satiation levels of per capita consumption; a countervailing move to more capital-intensive production systems and increased substitution of labour by capital; and a progressive improvement in total factor productivity (TFP), which is expected to be positive for developing countries as a whole, although variable across regions.

### Foreign direct investment

Foreign direct investment (FDI) in agriculture is expected to play an increasingly important role in achieving agricultural growth and poverty reduction. The FDI

share of the global supply of international investment has risen from 1 percent in 2001 to around 20 percent today. However, a substantial proportion of FDI involves mergers and acquisitions, which is well down from its 2007 peak and is projected by the OECD (OECD, 2010b) to have declined by around 8 percent in 2010: this on top of a 19 percent decline in 2008 and a 43 percent decline in 2009. The G20 countries are the source of about three-quarters of the world's FDI and, in 2010, about 20 percent of G20 investment flowed to emerging economies. Almost 50 percent of the outward investment of emerging economies, equivalent to about 40 percent of the parallel G20 investment, went to other emerging economies. Should this trend expand, it could have important development benefits for emerging economies and implications for the implementation of good investment practice.

UNCTAD's *World Investment Prospects Survey 2009–2011* found that local market size and growth were the most frequently cited determinants of investment location, with the emerging economies of China, India, Brazil, the Russian Federation, Indonesia, Viet Nam, Poland and Thailand favoured by investors. Access to international or regional markets was also a priority, with preferred emerging markets including China, the Russian Federation, Brazil, Mexico and Viet Nam. The set of factors contributing to the quality of the overall business environment came a clear second to market size and growth, with only developed countries identified in this category. Other location determinants, such as labour costs, presence of competitors, and access to natural resources and capital market were cited less frequently. Cheap labour was cited for investing in developing countries, mostly in Asia, such as China, India, Viet Nam, Indonesia and Thailand. Indonesia was identified for access to natural resources, while Brazil and Viet Nam's investment incentive programmes also attracted prospective investors.

The inflow of FDI into agriculture amounted to approximately US\$3 billion per year by 2007, compared with US\$1 billion in 2000 (FAO, 2009i). While this is a substantial increase, it was across both developed and developing economies and represents a very small proportion (<0.15 percent) of total FDI in 2007 and of domestic private-sector investment in agriculture. Agriculture sector investors are primarily from the private sector, but governments and sovereign wealth funds are also involved, either in providing finance and other support to private investors or in making investments directly. In host countries, it is largely governments who are engaged in negotiating investment deals. Current investments differ from the historical pattern of FDI for agriculture in several key respects: they are resource-seeking (land and water) rather than market-seeking; they emphasize production of basic foods, including for animal feed, for repatriation rather than tropical crops for commercial export; and they involve acquisition of land and actual production rather than looser forms of joint venture.

### **Policy and governance**

For FDI to impact on rural growth and poverty reduction, it is essential for countries to have policy frameworks in place that allow them to attract more and better

investment in their agriculture sectors. Sustainable growth in agriculture relies on a wide set of macroeconomic, commercial, social and environmental policies that go well beyond traditional agricultural policies. Instruments such as the OECD *Policy Framework for Investment in Agriculture* provide guidance in investment policy design, investment promotion and facilitation, human resource and skills development, trade policy, environment, responsible business conduct, infrastructure development, financial sector development and taxation. The *Principles for Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources* initiative, involving FAO, IFAD, the World Bank Group and UNCTAD, is another important instrument designed to enhance the positive potential of FDI by avoiding negative effects in recipient countries. The *Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources* (discussed in Chapter 4) will set out principles and internationally accepted standards for responsible practices, providing a framework for states to develop their own strategies, policies, legislation and programmes that will allow government authorities, the private sector, civil society and citizens to judge whether their proposed actions and the actions of others constitute acceptable practices.

Significantly more resources are required to prevent a further deterioration of the food and nutrition situation in poor and food-insecure countries where coping capacities are challenged. A sustained global partnership is needed, bringing together governments, multilateral institutions, private sector, civil society and NGO actors to mobilize domestic and external resources and significant increases in development financing for food and nutrition assistance, safety nets, and agricultural investments, in particular for smallholder farmers. The CFS is building capacity to fulfil this latter role.

### **Quantifying investment needs**

It is estimated that, in 2007, the level of investment in agriculture was US\$189 billion, of which two-thirds (US\$142 billion) was private investment. As shown in Figure 23, most investment in agriculture in developing countries, both public and private, is actually funded from domestic sources.

An estimated annual investment of US\$279 billion, including US\$204 billion in private investment, will be required to meet food demand in 2050. If ODA and FDI increase in proportion to the required amount of private investment, then ODA to agriculture would need to increase to US\$12 billion per year and FDI in developing country agriculture would increase to US\$4 billion per year. To reduce hunger by half by 2015 and eliminate hunger completely by 2025, FAO estimates that total public investment in developing country agriculture would need to increase to US\$120 billion per year. If ODA to agriculture continued to increase in proportion to domestic government expenditures, it would rise to US\$20 billion per year. Alternatively, if ODA increased to 0.7 percent of donor countries' GDP, as previously committed, and if agriculture's share of ODA increased to 17 percent, as seen in the early 1980s, ODA to agriculture would rise to US\$44 billion per year. However, despite the mounting evidence of food insecurity catalysing civil unrest,



there is scant evidence that ODA will rise sufficiently to meet this challenge. It remains a major challenge for FAO to provide the evidence base and best practice examples that will stimulate the political will to meet these critical ODA targets and the means for its supporting strong sector growth.

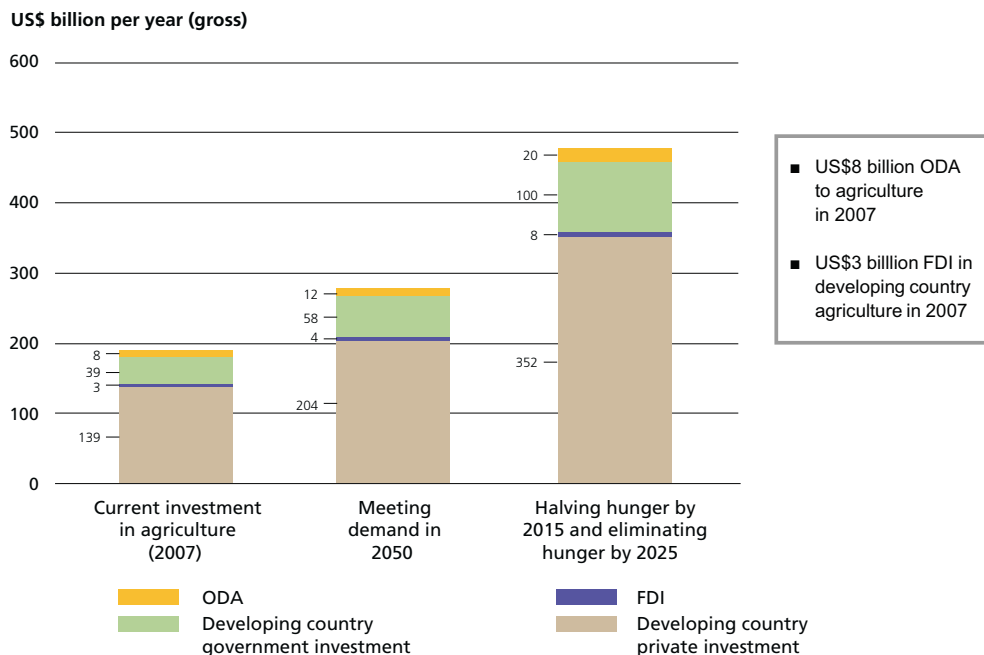
### ■ Mobilizing resources and creating a benign investment environment

In 2011, FAO is implementing about 1 500 emergency and technical cooperation projects, with an overall delivery of US\$891 million in 2010. A small percentage of these projects are funded from assessed contributions through FAO's Technical Cooperation Programme (TCP) and Special Programme for Food Security (SPFS). The remainder is funded from voluntary contributions. Currently, more than 150 unilateral, bilateral and multilateral resource partners contribute voluntary financing to FAO's programmes.

FAO has faced enormous challenges in recent years in adapting its funding mechanisms to highlight a demanding investment environment, in which mobilization of development resources has become increasingly competitive and where the focus of funding is on infrastructure buildup rather than on the agriculture and

FIGURE 23

#### Sources of investment in developing country agriculture, including estimated requirements



Note: Estimated increases calculated in proportion to the required amount of private investment to meet food demand.

Source: FAO (preliminary estimates).

rural sectors as such. The situation has been compounded recently by the scarcity of resources resulting from the global economic crisis.

While FAO has been an important participant in the development and implementation of a significant proportion of ODA investment in agriculture worldwide, those investments fall well short of what is required to build a sustainable agricultural economy in the developing world in order to assure global food security and nutrition in 2050. More voluntary funding is critical. Private investment, particularly from domestic sources, will be the primary driver of agricultural growth in the coming decades, and rising public investment – primarily from developing country governments – will be an absolutely essential “pump primer” for expanded private investment. Unless the targeted levels of investment – government, ODA, domestic private and FDI – for ensuring food security are realized in the near future, the prospect of a food-secure world will remain elusive.

To mobilize the necessary resources and ensure an appropriate investment environment, FAO will continue to work closely with national governments, developing capacity for effective policy reform, strategy development and investment planning and implementation. There is ample evidence that sufficient food availability, access, utilization and stability can result in the establishment of an environment in which private-sector investment can thrive in a transparent, accountable and regulated marketplace, backstopped by sufficient and efficient public investment in rural infrastructure, research and development.

## **Technology development, transfer and opportunities**

The development and exchange of appropriate technologies are essential for achieving global food security in the face of the challenges discussed in this book. Furthermore, as consumers place greater emphasis also on the quality and safety of food and the sustainable use of resources in its production and distribution, technologies and systems are all the more important for ensuring adequate controls along the food chain.

Substantial organizational and institutional changes have been taking place in the agriculture sector of most developing countries. Increasing concentration is taking place at all levels, particularly in the retail and processing sectors. Agribusiness enterprises are becoming larger as firms seek economies of scale in food manufacturing, marketing and distribution. Food is increasingly being retailed through formal outlets such as supermarkets rather than through local markets.

While these trends have opened a diverse range of market opportunities within the developing countries themselves and in export destinations, tapping into these opportunities is contingent on meeting very stringent requirements. This poses a major challenge for small-scale farmers, traders, processors, wholesale markets and retailers, many of whom risk being excluded from the benefits of these opportunities if they do not have knowledge of and access to the required technologies.

PHOTO 12

Finished products must meet consumer needs as well as food safety and quality requirements.



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### ■ Technologies for food security and safety

Technologies used to obtain farm inputs, such as seeds or fingerlings, and to undertake farm operations have a significant impact on the quality of the raw materials that enter into processing and other operations carried out further downstream in the value chain. They also affect the attributes of the final product that reaches the consumer's table. Such technologies include those applied in breeding and feed manufacturing, field equipment that respects environmental sustainability, machinery and farm power for production, and weed, pest and disease control systems.

Technologies for ensuring that processing operations yield finished products that meet consumer needs as well as food safety and quality requirements are an essential aspect of agriculture today. These include: technologies for converting commodities into differentiated finished products that have an enhanced value and meet quality requirements; biotechnologies and other technologies for obtaining specific ingredients and food components such as antioxidants, flavours and functional ingredients; preservation techniques such as pasteurization and drying, which prolong shelf-life and reduce the risk of contamination; packaging technologies to prolong the shelf-life of products while enhancing quality or safety and convenience in culinary use; and technologies for branding, labelling and certification in order to differentiate products, ensuring traceability and compliance with standards and quality requirements.

Well-coordinated logistical arrangements are required along the production-to-distribution chain to meet the requirements of the new market place. This involves cost-effective systems for handling raw materials and intermediate and finished products, as well as ICT systems that provide information on product flows, quality characteristics of products and financial transactions at all stages of the chain. Cold-chain logistics systems, which accommodate perishable products such as meat and horticultural produce and provide needed support along the increasingly elongated distribution chain, have also become more important. The

same is true for traceability systems, which make it possible to follow the progress of products through all stages of production, processing and distribution, facilitating logistics and providing assurances to the consumer of the safety and origin of such products.

### ■ Promoting value-adding technologies

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The application of science and technology to improve living standards in developing countries has been a primary goal of FAO since its foundation. FAO provides a broad range of technological options for adding value to agricultural raw materials, starting with assessments of the diverse levels of skill, infrastructure and production in member countries, and leading on to technology proposals that are appro-

#### BOX 18

#### **On the ground – reducing post-harvest losses in Afghanistan**

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In the northern region of Afghanistan where more than half the country's cereals are produced, many farmers traditionally store their crops in plastic and fibre bags or in farm buildings that do not have proper flooring, doors or windows, resulting in significant post-harvest losses. In seeking support from FAO, the Afghan Government requested silos for communities and farming households for grain storage. From 2004 to 2006, with funds provided by the Federal Republic of Germany, FAO implemented a project to reduce post-harvest losses by improving household and community storage facilities in seven grain-producing provinces, while at the same time improving the technical capacity of local artisans to construct metallic grain silos.

Technical personnel from the Ministry of Agriculture and NGOs trained 300 local artisans in the manufacture of silos and issued contracts to more than 100 tinsmiths to build metal silos ranging from 250 to 1 800 kg capacity for distribution in local communities. The project also supervised the construction of grain warehouses for community use at 12 sites and trained beneficiaries on how best to operate and manage them.

As a result of using the metal silos to protect their grains from insect, rodent or mould attacks, farmers' incomes increased when their crop losses dropped from 15–20 percent to less than 1–2 percent. In addition, participants could store their grain for longer in the silos, which meant they could wait to sell the stored grain when market prices were higher. The artisans involved went on to set up profitable silo-fabricating micro-enterprises on the strength of the training received from the project.

*Source:* FAO, 2007b.

priate to the circumstances of the end-user. Scalability, cost-effectiveness, energy requirements and environmental impacts are taken into consideration in all cases.

FAO has found that the efficient transfer and adaptation of small-scale processing technologies tends to be limited by the capacities of the users, who often lack the basic scientific knowledge of the processes and inputs involved and of the processes required for their correct implementation. Basic infrastructure, such as suitably equipped laboratories with consistent working conditions, a constant supply of good quality water and reliable power supplies, are critical elements for the transfer and adaptation of these technologies. It is therefore essential to build institutional capacity for research and development geared towards a better understanding of relevant technologies. Governments need to formulate supportive national policies that promote small-scale agro-industrial development.

In supporting the transfer of small-scale food processing technologies to developing countries, FAO primarily focuses on developing capacity through field projects and training programmes designed to upgrade technical, marketing and management skills. It also advises governments in the formulation of national programmes and policies that support small-scale technologies and fosters technical cooperation among countries.

### ■ Value chain approaches

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With the transition to market-driven systems and greater reliance on the private sector, interventions to upgrade value-adding processes and strengthen the capacity of various actors to meet market requirements are planned in the context of value chains. This means using systemic rather than disjointed single-point interventions to improve the efficiency of the chain as a whole. It also means recognizing the central role of the private sector and developing strategies that provide economic incentives to all actors in the chain. Some of the key elements of the value chain programmes being implemented by FAO include:

- strengthening and supporting the development of associations, producer organizations and cooperatives that can achieve economies of scale in buying inputs and selling products for their members;
- fostering public- and private-sector cooperation in order to encourage private-sector technology development and transfer, as well as to enhance the effectiveness of private-sector compliance with regulatory frameworks;
- building the capacity of chain partners and reinforcing business services available to them so that they can understand and meet the quality, safety and other requirements of their customers.

FAO's approach also includes strengthening the policies, institutions and support services that create an enabling environment for private enterprises related to food safety regulation; establishing and enforcing grades and standards; supporting product, technology and process innovation; fostering public-private sector cooperation; and attracting FDI as a way of improving access to new technologies.

## ■ Environmentally friendly technology

There is increasing pressure to develop technological systems that serve agricultural producers, processors and consumers as well as the environment. Yet rising energy costs, the highly energy-intensive processes needed to obtain products required by consumers, the high level of perishability of agricultural products and the longer distribution chains required to deliver them pose an immense challenge in important areas such as decreasing the carbon footprint used along the production-to-consumption continuum.

Major public and private investments are required for research, development and transfer of technologies for producing the products required by consumers throughout the world. Today's research and extension systems focus mostly on issues related to production systems, for example breeding and agronomy. However research and extension activities should also pay attention to the post-production sections of value chains. At the policy level, attention is also required to develop the institutional framework to support transfer of technologies to the private sector.

## Conclusion

As the world has globalized, so have the world's agrifood systems. As a result, national agriculture sectors as well as agro-business must now keep up with and adapt to market liberalization, growth of international trade, increased international financial transactions and capital flows, and advances in information and communication technologies. These developments have highlighted differences between developed and developing countries, as illustrated by the failure of world trade negotiations to agree on agricultural products and markets over the past decades. Developing countries have also been targeted by foreign business interests wishing to purchase or lease large tracts of their land, either for future biofuel production or as a way of "outsourcing" their country's food production.

FAO recognizes the importance of agricultural trade for poverty reduction and food security and supports member countries in issues ranging from trade negotiations to developing land tenure governance guidelines for dealing with potential land sales. The Organization is also increasingly partnering with the private sector, working with agribusinesses as well as their associations and business leaders on a wide range of issues, including value chain and subsectoral development projects and standard-setting activities.

With the increasing pressure on agriculture to produce food, feed and fibre for a growing and changing population while preserving the world's natural resources and mitigating climate change, investments in developing country agriculture are an absolute priority for governments, the development community and private investors. Investments in agriculture, however, have been declining for several years. Moreover, in their efforts to mobilize resources for agricultural development and

create an investment environment conducive to agricultural productivity and food security, FAO and its member countries are facing an extremely competitive and stringent financial resources market, calling for new and innovative approaches.

**P A R T**



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## CHAPTER 5

# Successes and lessons learned in policy development

Responses to the challenges of increasing world hunger over the past two decades have been manifold. FAO and its member countries have acted in a range of policy areas to identify effective actions and to engage stakeholders and the public at large in the fight against hunger. This is a critical part of the fight, even if, on its own, it is not enough. At the global level, one important task is now to strengthen the capacity of developing countries to participate in multilateral trade negotiations and adjust their agriculture and trade policies effectively. At the production level, the business side of farming must be supported. Farmers and others operating in the agriculture sector need the support of governments and their partners in the form of policies and extension methods that develop their capacity to save, accumulate fixed capital and continually reinvest in their own farms and related activities.

## Policy assistance in a changing environment

In the mid-1990s, FAO began a move towards decentralization which, among other things, made its decentralized regional and subregional offices the first port of call for national and regional policy advisory support. The role of FAO's headquarters in Rome has become more one of providing backstopping support to the decentralized policy officers, dealing with global and interregional policy issues and developing related studies and methodological guidelines.

Ultimately, FAO's policy support is effective only if its recommendations lead to policy decisions and subsequent implementation at national, regional or international levels. Still, measuring their effectiveness is difficult in practice, especially when the policy support is provided through the modality of global or regional agreements, which may require different action from country to country, and each action may have its own circumstances, needs and procedures. However, a number of approaches are common to many of FAO's policy support activities, such as linking operational assistance to normative frameworks, ensuring adequate financial resources for investment and using a variety of modalities for delivery.

### ■ Evolving nature of policy support

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FAO has been providing policy assistance to its member countries and their regional economic integration organizations (REIOs) since its creation. The nature of the

policy assistance, one of FAO's "core functions", has evolved over time, taking into consideration emerging issues and the changing priorities of its membership. An external evaluation of FAO's work in 2006 and 2007 found that member countries consider policy support one of the two areas of greatest priority; the other is capacity development.

FAO provides its policy assistance at global, regional and national levels, across the full range of its mandate, including agriculture, livestock, forestry, fisheries and aquaculture, trade, food and nutrition, rural development and natural resource management. Assistance is offered in the form of policy advice, capacity development for policy formulation and implementation, institutional strengthening and restructuring, country information, policy intelligence and monitoring, and identification of members' priorities for effective field programme development. Taking it further, FAO also supports the design of strategies and policies for agriculture, and for food security and nutrition in individual countries and REIOs, and the mobilization of financial resources for their implementation.

For example, FAO has supported the African Union and its New Partnership for Africa's Development (NEPAD) Programme since their founding in 2001. This has included assistance in formulating the strategy for NEPAD's Comprehensive Africa Agriculture Development Programme (CAADP), which was launched in 2003. Within the framework of CAADP, FAO has supported 51 African countries in the formulation of their National Medium-Term Investment Programmes and associated Bankable Investment Project Profiles.

FAO provided policy support to the 2003 Maputo Summit. The Summit produced the Maputo Declaration on Agriculture and Food Security, by which African Heads of State and Government committed to allocate at least 10 percent of their national budgets to agricultural development. This also included support in organizing several summits and high-level events focusing on agriculture and food security. Since 2009, FAO has supported African countries and REIOs in the development of their CAADP Compacts, which identify priority areas for investment, and national and regional investment plans for agriculture and food security and nutrition.

### **Developing and strengthening institutional capacities**

FAO has increasingly oriented its policy assistance towards developing and strengthening the capacities of regional and national public institutions. This work, carried out in coordination and partnership with national and international organizations, involves activities such as provision of in-service training programmes and workshops, including training materials and case studies disseminated online. Easypol, maintained by FAO, is an Internet gateway for online policy resource materials, and includes material on functional analysis for policy reform, multilateral trade negotiations, natural resource management, and policies for sustainable agricultural development.

FAO pursues capacity development through an annual high-level policy learning event designed for senior government officials and FAO Representatives at its headquarters in Rome. Other policy learning programmes, for specific areas, are

usually held at regional or subregional levels. For example, in the area of multilateral trade negotiations, FAO undertook activities to enhance the capacity of developing countries to analyse the implications of the WTO Agreement on Agriculture and to participate in the ongoing negotiation process. It also focused on strengthening countries' capacities to adjust their national food, agricultural and trade policies so as to take advantage of opportunities and minimize any adverse effects arising from the AoA.

For example, FAO organized a series of regional and subregional policy seminars for high-level policy-makers, with the participation of development partners, farmers' organizations and the private sector, on the design of appropriate immediate policy responses to the food price volatility that engulfed the world in 2007–2008 and again in 2010–2011. The *FAO Guide for Policy and Programmatic Actions at Country Level to address High Food Prices* formed a basis for discussion at the seminars.

With regard to institutional strengthening, FAO member countries often request assistance in establishing or strengthening policy and planning units in ministries of agriculture or in coordinating ministries or structures. Countries also have requested support in restructuring entire ministries.

### **Monitoring national policy decisions**

FAO monitors policy decisions, and also notes shifts in those decisions following major shocks or events. For example, in monitoring the policy decisions made following the global food price crisis in 2007–2008, FAO found government reactions taken in haste, if not in panic, sometimes contributed to exacerbating the crisis and aggravating its impact on food insecurity. Export bans, for example, often worsened the crisis; and emergency distribution of seeds and fertilizers by public organizations undermined existing private-sector distribution systems in some countries, weakening the services available for farmers once the crisis receded. It is this monitoring exercise that informed the guide that was the basis for the regional and subregional policy seminars.

### **■ Identifying emerging and contemporary development issues**

As part of its policy assistance, FAO identifies emerging and contemporary development issues, with the view to mitigating their adverse effects and harnessing their potential benefits for sustainable food security and agriculture development in member countries.

***Migration and remittances.*** FAO's work on migration and remittances aims to support countries in designing policies that facilitate the mobilization and channelling of remittances from citizens abroad into investments in agriculture and rural development in their home countries. Officially recorded remittances reached a high of US\$370 billion in 2007 and now stand around US\$335 billion a year, with remittances now the largest source of external financing in many developing countries. In addition to working on the link between remittances and

PHOTO 13

Investing in irrigation reduces dependence on imported food.



agricultural development and food security, FAO also focuses on the migration issue itself.

Migration reallocates labour associated with productive activities. In home countries, out-migration reduces labour available for food production and increases the work burden on those left behind. It also changes the comparative advantages for agriculture between originating and destination countries. FAO supports governments in designing policies aimed at counterbalancing the negative effects of migration, while creating an enabling environment for investment of remittances in the agro-rural sector.

***Incremental investments in agriculture.*** The global food crisis in 2007–2008 awakened the international community to the chronic underfunding of agriculture and the need to increase the volume of resources going into the sector. FAO's policy assistance in this area starts from the premise that while every effort should be made to increase the volume of investment in agriculture, volume is not enough. FAO's experience in working with developing countries strongly suggests that making a transition from economic stagnation to self-sustaining economic growth in agriculture – and consequently the overall economy – requires a sustained increase in the rate of domestic capital formation in agriculture.

The nexus between capital formation and agricultural growth, and agricultural growth and poverty alleviation, is complex. Empirical analysis clearly suggests, however, that the volume and composition of capital formation are the major determinants of agricultural productivity and output growth. Therefore, the quality of investment is as important as the quantity of investment.

The increase in domestic capital formation should be viewed in its broad sense, including investment in social overheads and economic infrastructure. Although such investment may yield only a small increase in income in the short term, it will create an environment needed for more profitable and cumulative subsequent investments. Experience in China, Thailand, Brazil and Viet Nam clearly demonstrates how a sustained increase in capital formation in agriculture generates subsequent growth opportunities in agriculture and the economy as a whole.

## ■ Future direction of policy support

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There is a constantly growing demand for policy assistance, which FAO will need to respond to with shrinking human and financial resources. Of necessity, its policy work will focus on those issues that are of priority to member countries and for which FAO has a clear comparative advantage. These include:

- the unacceptably slow progress in the alleviation of hunger and poverty in several countries where the number or the prevalence of undernourished people is large or even increasing;
- the effects of the swift transformation of agriculture worldwide;
- the imbalances between food supply and demand, in light of the increased use of food products for biofuel;
- the increasing transboundary movements of humans, goods and services in food and agriculture.

### Policy support to technical areas

FAO provides policy advice on issues dealing with threats to, and the suboptimal supply of, global public goods, in particular healthy ecosystems, water, biodiversity, climate and energy. The related need for sustainable intensification of resource use in the rural sector is itself another challenge, which is linked to facilitating adequate and effective innovation and exchange of best practices. Generally, development policies that facilitate broad access to technologies are part of a wider process that helps overcome the existing knowledge divide between and within countries through efficient and effective communication and capacity development. In this context, FAO policy work – through case studies and high-level policy seminars – contributes to promoting intercountry and interregional transfers of best practices in agriculture and of the food security development policies and strategies using the value-chain approach.

As can be seen, this calls for two types of global policy work. FAO must maintain or even strengthen its capacity to provide general and cross-cutting policy support with regard to global public goods, meaning global governance in food, agriculture, fisheries and aquaculture, and forestry; and information and knowledge exchange. FAO should also take the lead in initiatives that address specific and thematic policy issues that require concerted action, such as:

- accelerating progress in the alleviation of hunger and poverty;
- dealing with rapid transformations in agriculture and the strong demand growth that has frequently been associated with limitations in the supply-side response;
- addressing the global threats to natural resources and ecosystems, in particular from the effects of climate change;
- enabling agriculture and rural areas to adapt to changing environments;
- improving data availability, knowledge generation and dissemination;
- responding to energy scarcity;
- facilitating the effective functioning of innovative systems and ensuring broad access to new technologies;



- assisting member countries and their populations in coping with food emergencies;
  - reducing vulnerability and building resilience to the threats and changing nature of disasters and food emergencies.
- At the same time, a proven set of four key principles guides, and will continue to guide, FAO's policy work:
- Support must conform to FAO's three global goals: overcoming hunger and malnutrition, agriculture contributing to economic and social development, and sustainable management of the natural resource base for food and agriculture.
  - Policy support must assist countries and the global community in making their own informed decisions and contribute to concrete actions that have a realistic chance of delivering positive outcomes.
  - Policy advice provided must be neutral and evidence-based.
  - Focus must be maintained on areas of comparative advantage.

### **Changing context of FAO's comparative advantage**

In terms of the policy advice and support FAO provides to its members, the key question remains the extent to which national governments, in collaboration with international partners, civil society and the private sector, are able to take the necessary policy action to address the future challenges resulting from the driving forces of global change, and, where this is not the case, how the necessary political will can be galvanized.

Over the years, FAO has sought to meet the demand for policy assistance from its members and their REIOs, adapting the nature and method of delivery to the changing times. It supports its members in confronting current challenges and is prepared to support them in facing the new challenges as they emerge.

FAO has a comparative advantage where it is the sole provider of a good or service, and where it can demonstrate evidence of high effectiveness and impact in its work relative to other providers. Evidently, what constitutes FAO's comparative advantage will be subject to change over time due to various factors, such as changes in FAO's own capacity and performance, or changes in priorities and performance of development partners and other UN agencies.

### **Gender-sensitive policy advice**

Achieving gender equality plays a central role in eliminating poverty, raising levels of nutrition and standards of living as well as improving the productivity in agriculture, forestry and fisheries sectors and livelihoods of rural populations. Understanding gender roles and addressing gender inequalities are of key importance for improving livelihoods in developing countries. Women and girls continue to face limited access to and control over productive resources, and agricultural and rural development responses have traditionally not been sufficiently aware of

or responsive to the distinct roles, priorities, knowledge, constraints and opportunities of women.

While FAO has consistently aimed to provide gender-sensitive policy advice to policy-makers in member countries, there has been an evolution in the focus. Initially, policy-makers targeted issues and data specifically dealing with women. In later years, FAO adopted a gender-sensitive approach, providing policy advice relevant to needs of both men and women farmers. This proved a successful shift, as it gave policy-makers the opportunity to address sociocultural and economic impediments that would hold women back *vis-à-vis* men. However, this has not always been successful, as the term “gender” is still often interpreted as considering only women rather than the existing social relations of power between men and women.

FAO has learned that, for successful policy development, any intervention must be preceded by a thorough gender analysis. All stakeholders – from ministries to farmers – need to be involved at all stages of the decision-making process in a consultative and participatory way, and progress needs to be monitored and evaluated and accompanied by capacity development. Successful policies emerge from the recognition and definition of the needs of those they are designed to help and they are subsequently evaluated by those same people in terms of the impact they have had on their lives.

## ■ Contribution of women to agriculture

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Women make essential contributions to agriculture in developing countries, but their roles differ significantly by region and have been changing rapidly due to globalization. Women comprise, on average, 43 percent of the agricultural labour force, ranging from 20 percent in Latin America to 50 percent in eastern Asia and sub-Saharan Africa. Their contribution to agricultural work varies even more widely depending on the specific crop, type of involvement and activity.

Despite this variability, women also share commonalities across regions: they have less access than men to productive resources and opportunities, and also live

### BOX 19

#### Fighting hunger by closing the gender gap

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Closing the gender gap in agriculture would generate significant gains for the agriculture sector and for society. If women had the same access to productive resources as men, they could increase yields on their farms by 20 to 30 percent, raising total agricultural output in developing countries by 2.5 to 4 percent, which in turn could reduce the number of hungry people in the world by 12 to 17 percent. The potential gains vary by region depending on how many women are currently engaged in agriculture, how much production or land they control, and how wide a gender gap they face.



with pre-existing socio-cultural prejudices. The gender gap is often found in access to assets, inputs and services – land, livestock, other productive assets, labour, education, extension and financial services, and technology – and it imposes costs on the agriculture sector, the broader economy and society.

### ■ Gender constraints

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Gender is not only a key determinant of access to productive resources, it also is the basis for the division of labour within the household, the social value attributed to different types of work, and bargaining power – making it a key determinant of decent work outcomes. Access and denial, opportunities and privileges are granted according to gender, often embedded in the legal, social and cultural norms of the society in which men and women live. Institutions may resist or remain slow to change, which is one of the main challenges to policy-making and policy adoption.

Gender inequalities are widespread in rural employment, which includes paid and self-employment in farming, fisheries and aquaculture, forestry, small enterprises providing goods and services, and on- and off-farm wage labour. Women often work in the lowest paid and most precarious forms of employment.

Furthermore, women continue to be affected by the invisibility of their contribution. They are heavily engaged in domestic and reproductive tasks, which are crucial to the maintenance of households, families, kin groups and communities, but which are nevertheless regarded as an extension of household duties and hence, for the most part, remain hidden economically. The fact that many of these care burdens are transferred to girls (daughters) tends to perpetuate cycles of impoverishment and gender inequality, especially as it keeps young girls out of school and away from education opportunities. This, in turn, translates into low-skilled and precarious employment opportunities in the future.

### **Burden of unpaid work**

Household work often involves activities that are time-consuming and insufficiently remunerated, if compensated at all. Rural women spend much of their day caring for their children, preparing food and collecting water and fuel as well as assisting other family members who are ill or disabled. This burden increases even more in households stricken by HIV and AIDS and aggravates labour shortages for agricultural production and income generation. Besides having the sole responsibility for domestic chores, rural women often work as unpaid family workers on family farms or in family businesses. In areas with increasing climate variability, where traditional agricultural activities have become less viable or profitable, men are pushed to migrate and the burden of both farm and domestic work is left to women. To stimulate gender-equitable poverty reduction in rural areas, the importance of the economic implications of unpaid work needs to be addressed, as does the disproportionate burden that falls on women and limits their access to all forms of paid employment, and rural women's access to decent agricultural and non-agricultural employment needs to be facilitated.

## Access to land and credit

Land access and ownership is the prime productive asset in most rural areas of developing countries. Owning and working on land owned by others and securing waged farm work often depends on complex gender-based society-specific customary and legal frameworks. These institutional issues are key indicators of poverty and lower incomes because the allocation of labour and the benefits and distribution of the products from land are determined by gender. The specifics vary from place to place, but globally there is a sociocultural and historical bias that impedes women's control of land as a productive resource.

Women seldom own the land they cultivate. In all countries for which data are available, women are less likely to own land, and they own smaller amounts of land when they do own it. Women's restricted control over land reflects deep-rooted land tenure customary practices and laws. Especially important in this respect are the customary inheritance norms that determine access to land and that may contradict the existing legal norms.

The limited and insecure access to land that women tend to have usually affects their water and grazing rights, hinders their access to credit, and limits their land use and cropping choices and their ability to maintain diversified livelihood systems. All these, in turn, constrain their farm and off-farm income-generation activities, particularly in the case of environmental, political or economic shocks and crises.

Even where land is less of a binding constraint for women, limited access to credit and finance can further hinder their decision-making power and autonomy within the household and in the community as access to markets is not gender-neutral. Legal barriers and cultural norms may bar women from holding bank accounts or entering into financial contracts in their own right. Women have less control over the types of fixed assets that are usually necessary as collateral for loans. Institutional discrimination by private and public lending institutions keep women out of the market or grant women loans that are smaller than those granted to men for similar activities. Moreover, even when women are able to obtain credit, resources may not be used to support their own activities but those of the men, particularly in male-headed households.



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**PHOTO 14**

Women's limited and insecure access to land affects their water and grazing rights, hinders their access to credit, and restricts their land use choices.

**BOX 20****Women's participation in rural employment**

Gender-sensitive policy will take into consideration that women's participation in the labour force – whether they are employed in the agriculture, fisheries or forestry sectors or as simple labourers – exhibits significant differences compared with rural men.

*Contract farming.* Female farmers are largely excluded from modern contract-farming arrangements because they lack secure control over land, family labour and other resources required to guarantee delivery of a reliable flow of produce. Moreover, much of the farm work done on contracted plots is performed by women as family labourers, who may work longer hours and receive less remuneration than men.

*Livestock.* Within pastoralist and mixed farming systems, livestock play an important role in supporting women and improving their financial situations. An estimated two-thirds of poor livestock keepers are women. They share responsibility with men and children for the care of animals. Particular species, such as poultry and dairy animals, and types of activity are more associated with women than men. Female-headed households are as successful as male-headed households in generating income from their animals, although they tend to own smaller numbers of animals, probably because of labour constraints. However, women's presence in intensive production and market chains associated with large commercial enterprises tends to be minimal.

*Fisheries and aquaculture.* Although comprehensive data are not available, case studies suggest that women may comprise up to 30 percent of the total employment in fisheries. They are more commonly occupied in subsistence and commercial fishing from small boats and canoes in coastal or inland waters. In aquaculture, women take care of fish ponds, feed and harvest fish and collect prawn larvae and fish fingerlings. Although they rarely engage in commercial offshore and long-distance capture fisheries because of the vigorous work involved or because of their domestic responsibilities and/or social norms, they contribute as entrepreneurs and labourers along all phases of the fisheries supply chain.

*Forestry.* Women contribute to both the formal and informal forestry sectors in many significant ways. From nurseries to plantations, and from logging to wood processing, women make up a notable proportion of the labour force in forest industries throughout the world. Although women contribute substantially to the forestry sector, their exact roles are not fully documented, their wages are not equal to those of men and their working conditions tend to be poor.

*Labour markets.* Women generally face gender-specific constraints as agricultural labourers and in hiring-in labour. They not only have lower labour

productivity as a result of inadequate training and education and nutrition-related health problems, such as iron deficiency, but also face pronounced gender division of labour for particular agricultural tasks, with the result that male and female labour cannot be easily substituted.

### **Access to employment opportunities**

Education and training are the key to accessing remunerative jobs, and women without such assets are often in a disadvantaged economic position relative to men in terms of benefiting from wage labour. They are disproportionately employed in jobs of a low standard, including activities in which gender equality rights are not adequately respected and social protection is limited or non-existent. Partly because of this, women earn less for a given type of work than men (see Box 20). Moreover, because of the competing demands of care responsibilities and their engagement in the informal non-market economy, women, on average, spend less time in remunerated work and therefore earn less.

### **Access to education, training, information and extension**

Human capital is a major factor in determining the opportunities available to individuals in society and is closely linked to the productive capacity of households and their economic and social well-being. Gender differences in education are significant and widespread, reflecting a set of culturally based biases against girls, especially those living in rural areas. Although recent evidence suggests that the gap is closing, female household heads in rural areas are still found to be disadvantaged with respect to capital accumulation in most developing countries, regardless of region or level of economic development.

The provision of education is a crucial mechanism in child labour prevention, which is even more significant in rural areas because the majority (60 percent) of child labourers worldwide work in agriculture. Given that rural girls tend to spend more time on domestic chores than rural boys, they are at a higher risk of not attending the school and gaining less education. In turn, their entry into the labour markets will be on the lower end and under worse conditions.

This gender gap is not confined to general education, but extends to extension services, which include a wide range of services provided by experts in the areas of agriculture, agribusiness and health. They are designed to improve productivity and the overall well-being of rural populations, and they can lead to significant yield increases. In developing countries, the availability of such services remains low for both women and men, but women benefit less than men, as they do not have the necessary access to information or adequate preparation to take advantage of them.

The very low numbers of female extension officers in developing countries makes it harder for women to be able to attend public meetings, which are usually run and attended by men. This is especially significant in social contexts where meetings between women and men from outside the family nucleus are restricted. Other

reasons are directly related to women's general access to education and access to resources, as training often entails reading a considerable volume of written materials, whereas rural women continue to have higher illiteracy rates than men. Male farmers are targeted for extension training as they are (erroneously) considered to be the only ones able to adopt modern innovations, thus bypassing women who, on the contrary, have been shown to be great innovators in agriculture.

### **Access to markets**

Both domestic and international markets are gender-based institutions. The unequal access to markets for women results from gender inequalities in access to resources such as capital, technology, information, education and land. All these constraints interact with each other and determine the bargaining power of the various actors participating in the production, processing and sale of goods.

Cultural factors play a significant role in maintaining these inequalities. Women's contributions to household care services, cultural biases that determine women's roles, potential harassment by market or trade officials, all make it difficult for women to travel long distances and seek the best prices for their output. As men are holding the visible power in market exchanges, they are more likely to be approached by agricultural companies or other representatives wanting to engage in business. Women may also face cultural and socio-economic barriers to membership in rural organizations and cooperatives, which may further inhibit market access.

### **■ Addressing the gender gap: a complex challenge**

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The livelihood issues faced by women are all related to inadequate access to the relevant resources, services, benefits and decision-making mechanisms that could alleviate the underlying processes determining poverty and hunger. Dominant cultural norms lay the foundations for the existing gender gap in most societies where women are in a disadvantaged position. Because of this, reducing and eventually closing the gender gap requires the implementation of adequate measures and policies specifically designed to eliminate existing inequalities in all areas. The approach should not be confined to changing the elements of the existing legal system that permit differential treatment of women and men, but it should also include measures designed to address the direct causes of the gap, as well as aiming to change the cultural perceptions of deep-rooted unequal gender relationships.

The challenge of ensuring gender equality is not insurmountable but it is complex. Major constraints such as access to and ownership of land, access to and control of credit, illiteracy and insufficient access to markets, are deeply rooted in sociocultural norms (sometimes even legislation) and are difficult to change. They need to be addressed in a holistic and committed manner with dedicated political will and resources in the short term and long term.

The question in the 21st century remains: can FAO deliver on its mandate to assist policy-makers in achieving gender equality in agriculture? Learning from past

lessons and applying renewed commitment and resources, FAO as the key specialized agency for agriculture, can deliver on its promise.

## Access to land

Land and natural resources provide a platform for livelihoods and a basis for social, cultural and religious practices. Pressure on these resources is increasing as new areas are cultivated, occupied by urban extension or abandoned because of degradation, climate change or violent conflict.

In light of such pressures, secure access to land and other natural resources has become even more important to the alleviation of hunger and rural poverty. Rural landlessness is often the best predictor of poverty and hunger: the poorest are usually landless or land-poor. Inadequate rights of access to land and other natural resources, and insecure tenure of those rights, often result in extreme poverty and hunger.

When participants at the World Summit on Food Security in 2009 called for improved access to, and secure tenure of, land and other natural resources, they reaffirmed the linkages between food security and land tenure that have been part of FAO's focus since the organization was founded, and particularly since the 1966 World Land Reform Conference.

### ■ Governance of land tenure

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While weak governance of land tenure and other natural resources hinders economic growth and sustainable use of the environment, responsible governance can help reduce hunger and poverty and support social and economic development. Weak governance has the most severe impact on the livelihoods and survival of people in developing countries and is not specific to country, region or development level. The FAO-supported Global Corruption Barometer 2009 of Transparency International highlighted the fact that corruption in land issues is commonplace throughout the world (Transparency International, 2009).

The rapid development of contemporary geospatial technologies, such as satellite imagery, aerial photography, global navigation satellite systems, hand-held computers and geographic information systems, has created unprecedented opportunities to use geographic information in support of good governance. FAO promotes technical and other forms of cross-border cooperation in establishing infrastructure for spatial information compatible and usable in a national and transboundary context.

Responding to widespread interest, in 2009 FAO embarked with global partners on the development of the *Voluntary Guidelines on Responsible Governance of Tenure of Land and Other Natural Resources* (FAO, 2011e), an initiative which builds on normative work that started in 2005. FAO is also working with IFAD, the World Bank and UNCTAD on *Principles for Responsible Agricultural Investment that Respect*

**BOX 21****Land redistribution project in the Philippines**

FAO has supported the Philippine Government's Comprehensive Agrarian Reform Programme (CARP) through technical assistance targeted at agrarian reform communities, which are clusters of villages (*barangays*) where 60 per cent or more of the population have received land through the land reform programme.

FAO focus has been on raising agricultural productivity by:

- supporting farmer-led development teams within agrarian reform communities to identify problems, needs and priorities and to incorporate these in community development plans, all carried out in a participatory and holistic way through the farming systems development approach;
- training in a variety of areas, including farm and non-farm activities, accounting and book-keeping, and gender issues;
- promoting the establishment of linkages between agrarian reform beneficiaries and agribusiness in order to provide the former with market outlets;
- facilitating access to credit by fostering matches between agrarian reform beneficiaries and financing institutions.

*Rights, Livelihoods and Resources.* These two initiatives address different but inter-linked issues, and they will be complementary and refer to each other.

**Improving access to land through redistribution**

Although the number of major land reform programmes has decreased since the 1979 World Conference on Agrarian Reform and Rural Development, redistributive land reform remains an important instrument to provide land to the poor. Such redistribution is of particular importance in countries where much of the land is possessed by a relatively small number of landowners, and where the land is idle or underutilized. Land reform interventions require much more than the redistribution of land, and beneficiaries must be provided with institutional inputs, such as credit and marketing, and physical infrastructure, such as road networks and irrigation. Land for the beneficiaries of reforms is usually acquired from private landowners but, in some countries, state-owned land has also been used. Box 21 describes an example of FAO's work in this area.

**Improving access to land through leasing**

For many of the poor who have little or no land or capital, leasing offers a way to gain access to land. The promotion of family-owned farms has not necessarily led to the demise of leasing arrangements and, even though some governments have



made an effort stop it, leasing continues to be significant. In reaction to such government efforts, many leasing arrangements have become “informal”, meaning they no longer have any legal protection. In addition to providing benefits to poor farmers, equitable leasing arrangements also provide some landowners, particularly the elderly and infirm who can no longer work their land, with an opportunity to have an income.

### **Improving access to land in emergencies**

Some of the most drastic effects of natural disasters on peoples’ livelihoods relate to disruption of land tenure systems and property loss. If people leave their land as a result of a natural disaster in an area where property rights are unclear, land grabbing and abusive building practices can take place, especially where there are no suitable norms or where norms are not enforced.

In countries emerging from violent conflicts, the provision of land to refugees and internally displaced persons (IDPs), and sometimes to members of militias involved in the conflicts, is an essential part of establishing lasting peace. To be sustainable, disaster risk management strategies must address the rights of resident communities as well as refugees and IDPs. Access to land by refugees and IDPs should be understood in the context of achieving tenure security of customary rights for resident communities while also taking into consideration gender issues.

### **Improving access to land for pastoralists**

The expansion of agriculture into arid or semi-arid areas has placed pastoral rights of access under threat. At times, policies promoting commercial ranching or cultivation have failed to recognize that the variability of rainfall in arid and semi-arid areas requires pastoralists to have access to extensive rangelands. Removal of some lands traditionally used for pastoralist production for commercial ranching restricts the mobility of pastoralists. As a result, there is an overconcentration of pastoral livestock in those rangelands still accessible to the pastoralists, which can give rise to conflict.

### **Improving tenure security of privately held land**

An important aspect of providing tenure security is preventing the arbitrary loss of land rights. Countries retain powers of compulsory acquisition in order to enable governments to acquire land for specific purposes, but these powers are not always well exercised. FAO has prepared the guidelines “Compulsory acquisition of land and compensation” to assist governments in acquiring land in ways that balance public needs with the protection of private property rights (FAO, 2008f).

Rights to land can be made more secure through appropriate and effective land administration. Increasingly, the establishment of land registration and cadastre systems is being included in programmes to improve the security of access to land. In such programmes, it is important to give due attention to the interests of the poor and vulnerable, particularly women and indigenous peoples. To support countries, FAO has prepared a series of land tenure studies that include guidelines



**BOX 22****Land consolidation in Eastern Europe**

FAO and its partners are conducting a multi-year programme to assist transition countries in Central, Eastern and Southeastern Europe in developing responses to their specific problems of fragmentation and adverse rural conditions. The resulting development of expertise has had a catalytic effect and has expanded and strengthened other initiatives, including Future Approaches to Land Development (FARLAND), supported by the European Union. Based on the outcomes of earlier workshops, which identified the need for information on how to start land consolidation activities in a country, FAO prepared guidelines on the design and operation of land consolidation pilot projects, a technical manual for project managers and training materials on pilot project implementation.

Workshops and guidelines have allowed countries in the region to initiate activities in land consolidation. FAO has supported Armenia, Hungary, Lithuania, Serbia, Albania and Bosnia and Herzegovina in the introduction of land consolidation activities. FAO is promoting the development of the *Voluntary Guidelines on Responsible Governance of Tenure of Land and other Natural Resources* throughout the region and has begun related activities with the Russian Federation and countries in Central Asia.

on how gender matters should be addressed in land titling projects. New guidelines are under preparation on how to deal with gender dimensions in territorial development (FAO, 2002; World Bank, FAO and IFAD, 2009; Groppo and Sisto, 2009-2010).

Land registration systems commonly fail to secure the land tenure rights of the poor and the vulnerable. Weak governance as well as technical and institutional shortcomings reinforce the failures. The introduction of information technology has made rapid improvements in transparency possible by providing electronic access to records, and also has reduced discrimination through standardizing services and fee structures for electronic accounts. FAO initiated work in 2007 to assist member countries in improving tenure security through quick improvements in transparency and equity of governance by introducing affordable IT systems.

In Africa, most land is held under customary tenure even though it is formally owned by the state. FAO has worked on the recognition of customary tenure in formal, statutory law and has supported the formal delimitation and registration of community lands.

**Improving farming structures through land consolidation**

When farms are fragmented into parcels that are distant from where owners live, are not easily accessible, or are inappropriately shaped for agricultural purposes, it becomes difficult for farmers to implement new competitive production arrangements and to

**BOX 23****Learning from interventions in land use**

Following are some of the lessons learned from, or emphasized by, FAO interventions:

- Good governance and the rule of law are closely correlated with the successful implementation of processes to improve access to land, which requires non-biased macroeconomic policies.
- Reforms that aim to improve access only to land are not enough. They need to be coupled with provision of support services for beneficiaries, including access to capital, services and markets.
- Reforms are more likely to succeed when beneficiaries have experience in managing the land. Otherwise, knowledge and skills related to the technology and production systems used by successful local farmers need to be transferred to the new beneficiaries.
- Keeping a rational system of individual economic incentives is crucial. When incentives benefit individual families, the response to change is usually quick and highly dynamic.
- Reform of land rights and administration are best dealt with through long-term engagement that allows participatory policy-making and legislative processes; through continuing support in the implementation of new land laws, including training of officials and the judiciary; and support for the legal empowerment of the poor.
- Ensuring fairness between parties is essential to avoid conflicts and potential negative impacts. This includes addressing the rights of IDPs and the local communities in which they will be settled.
- Social capital formation through the participation of local communities and beneficiaries is important.
- Appropriate capacity for the administration of processes to improve access to land is crucial.
- Gender analysis and objectives should be explicitly included in programmes from the outset to ensure meaningful and equal participation of women and men.

use machinery and appropriate technologies. Land consolidation can enable farmers to acquire farms with fewer, but larger and better-shaped parcels. This also may enable them to expand the size of their holdings if state land reserves are available or if neighbours choose to exit farming. Box 22 gives an example of FAO's work in this area.

### ■ Changing context of access to land

The issues surrounding access to land continue to change in parallel with changing dynamics in the agriculture sector. In addition to improving access to land, FAO

also addresses areas such as recognition of indigenous people's rights to land and other natural resources, reflecting the generally collective character of indigenous rights. In addition, FAO has undertaken significant work in the context of:

- international private investments in agriculture, namely the purchase or lease of large areas of farmland for the production of food, biofuel, livestock and other products;
- mitigation of climate change, because tenure reforms, including the legal recognition of customary rights, are necessary to ensure that local communities, who are the *de facto* managers of forest lands, are able to benefit from payments under the REDD+ climate change programme (discussed in Chapter 3);
- creation of sustainable, local sources of revenue through property taxation, resulting from policies of decentralization of responsibilities for providing services from central government to local levels of government.

### **Equitable access requires political commitment**

Efforts to provide more equitable access to land usually involve a complex process addressing a multitude of ethical, political, social and economic objectives. The complexity of such processes precludes a simple evaluation of success or failure. Yet, it is evident that FAO's interventions to improve access to land have made a positive difference in the lives of people around the world. Although the conditions vary widely, the interventions have in common that they help improve household food security and provide an asset to reduce poverty. Of course, the problems related to access to land remain, and they are often those faced several decades ago. However, the answers to those problems have changed in accordance with changing social priorities.

Improving access to land requires strong political will and commitment by government institutions at all levels, as well as political, institutional and technical support from civil society organizations. Land policy reforms, including principles of gender equity, have to be embedded in comprehensive policy and institutional reforms to ensure the harmonization of all provisions, especially in countries where legal pluralism is practised. A legal framework for the clarification and regularization of individual rights and of common property resources is necessary to ensure tenure security and to favour investment.

### **Engagement with civil society**

The summit process that began in the 1990s was only one aspect of the new policy of outreach that FAO deemed necessary to support the battle against hunger in the world. Freeing millions of people from lives of poverty and malnutrition is too great a task for governments alone. The direct contact between high-level politicians and their counterparts during summits and other intergovernmental meetings can be very useful but, subsequently, it can still be difficult to marshal the required support for FAO's strategic objectives.

Civil society organizations (CSOs) have long been among FAO's principal partners outside government. Since the 1980s, CSOs have grown progressively in size, scope, number and geographical distribution. Step by step, they have acquired major local, national, regional and international impact to a degree that the world's institutional actors, FAO included, make concerted efforts to engage with them. The United Nations summits of the 1990s – including the Rio de Janeiro Earth Summit in 1992 and the Rome World Food Summit in 1996 – were instrumental in paving the way for the large-scale participation of CSOs, raising their influence in global governance to unprecedented levels.

The role of CSOs in advocacy, communication, policy formulation and field operations has become an essential component in all attempts to achieve sustainable development and food security. The three world food summits of 1974, 1996, 2002 and the High-Level Conference on Food Security in 2008 were attended by thousands of representatives from civil society and NGOs. They participated actively and dynamically and made major contributions to policy debates and dialogues and to the negotiated outcome documents of member governments. It is safe to say that, to date, a range of institutionalized spaces for policy dialogue have been put in place within the different bodies responsible for summit follow-up and monitoring that enable CSOs to participate in great numbers and to influence decisions taken by member governments.

### ■ Strengthening the CSO partnership

Over the decades, CSOs have come to recognize FAO for the catalytic role it has played in stewarding the policy outcomes of all the summits into concrete processes, mechanisms and programmes that are now embedded within FAO's activities. They have increasingly come to view FAO as a trusted, neutral broker in the field of food and agriculture.

FAO's ability to combine technical expertise with policy application has facilitated the establishment of partnerships between governments and civil society. FAO



**PHOTO 15**

Inhabitants of Kibezi camp for internally displaced persons, sustained by FAO and the NGO "Sauvons les Orphelins", work in the communal potato patch.

provides technical assistance in implementing global conventions, regulatory frameworks and voluntary guidelines and, in turn, gives CSOs and NGOs access to the technical data, information and knowledge, enabling them to build good working relationships at the field level and to produce their own information.

On FAO's part, there has been growing realization that interaction with the world of civil society provides an effective tool for both making policy and implementing it. CSOs, NGOs and their partners often give a voice to those most affected by hunger, malnutrition and poverty. This is particularly true when it comes to emergency interventions, especially in complex humanitarian disasters where governments do not have the immediate capacity to provide vulnerable populations with adequate services or inputs for food production, nutrition and food security.

The overall result of the FAO-civil society dialogue has been increasingly vibrant, and often indispensable, discussions between governments and non-state actors on policies and programmes, monitoring and implementation, as well as resource allocation. This first became apparent in the mid-1990s during debates on matters as important and varied as the Code of Conduct for Responsible Fisheries (1995), the Code of Conduct on the Distribution and Use of Pesticides (2002), the International Treaty on Plant Genetic Resources for Food and Agriculture (2001) and the Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security (2004).

### **Full partners for the new millennium**

***Committee on World Food Security.*** During 2008–2009, CSOs and NGOs directly contributed to the reform of the global governance of agriculture in the CFS, participating actively in the contact group in charge of negotiating the new vision, role and procedures for the Committee. Today, CSOs and NGOs occupy four of the 13 seats in the Advisory Group to the CFS Bureau. Following the Committee's endorsement of civil society's collective proposal for an international food security and nutrition civil society mechanism, the 36th Session of the CFS invited CSOs and NGOs to participate fully in the proceedings, taking roles in both plenary debates and negotiations which ensured them full visibility and effectiveness.

The mechanism promotes ambitious people-centred participation with equitable geographic representation, including constituencies of smallholder family farmers, artisanal fishers, herders and pastoralists, the landless, the urban poor, agricultural and food workers, women, youth, consumers, indigenous peoples and NGOs. It can be expected to further heighten CSO/NGO participation in key policy areas (such as land, water, gender, the right to food, climate change and biosafety) in the FAO regional conferences and in national food security and nutrition fora and platforms.

***Special Programme for Food Security.*** FAO's Special Programme for Food Security (SPFS) also offers opportunities for FAO and NGOs to exchange experiences in field work and bring constraints perceived by local farmers and civil society groups to the attention of policy-makers at various levels. In some countries, farmers'

organizations have been involved in the initial identification and planning phases. The facilitating role played by FAO in the development community related to food security enables civil society to build intersectoral and knowledge-sharing networks on food security and nutrition. The SPFS is discussed in detail in Chapter 6.

### **Farmers' organizations**

FAO has a long history of partnering with farmers' organizations. One of its oldest NGO partners is the International Federation of Agricultural Producers (IFAP). Founded in 1946, IFAP recently reconstituted itself and is now called the World Rural Forum, representing more than 600 million farm families grouped in 110 national organizations in 75 countries. It is a global network in which farmers from industrialized and developing countries can exchange concerns and set common priorities.

FAO also partners with the International Planning Committee for Food Sovereignty (IPC), a global network of NGOs and CSOs promoting food sovereignty. IPC includes social organizations representing small farmers, fishers, indigenous peoples, the urban poor and agricultural workers' trade unions. Many of these civil society actors remain engaged in global networking established during the NGO Forum held in parallel with the World Food Summit in 1996.

FAO's success in bringing the theme of agrarian and land reform back to the international agenda also cemented positive relationships with the CSO population. In March 2006, FAO convened the International Conference on Agrarian Reform and Rural Development (ICARRD) in Porto Alegre, Brazil, where civil society organized well-attended parallel fora and greatly influenced the outcome document of the conference. The *Voluntary Guidelines on Responsible Governance of Tenure of Land and Other Natural Resources* (discussed in Chapter 4) constitute the follow-up to this event.

### **Social movements**

The position of social movements on the conflict between trade liberalization and food security is often apparent in global debates. At the same time, FAO's member countries enjoy a constructive and frank dialogue with social movements in which the latter increasingly consider FAO a significant partner in the UN system, where consensus is achieved through the "one country one vote" system – a characteristic that sets it apart from multilateral economic and financing institutions such as the World Bank and WTO.

### **Public outreach**

Communication is crucial to FAO's role as a knowledge-based, information-sharing organization. It also is at the heart of FAO's mission to rally support for a world without hunger and lobby for more investment in agriculture. Climate change, the soaring cost of food commodities, debate over biofuels, anxiety about food security and zoonotic animal diseases such as swine flu, have brought food and agriculture

into the public eye. This attention also has given FAO a huge opportunity – and responsibility – to frame the debate on these issues.

### ■ Information dissemination and media relations

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Public information outreach to the media is considered one of the core functions of the organization. FAO is seen as a trusted source of information by national governments and technical experts in agriculture and rural development, NGOs and civil society organizations, but also by the news media, whose standards for reliable information are highly demanding. Sharing information and communicating knowledge are inherent in FAO's work, but at the same time, positioning FAO as a key player in international affairs and development debates, maintaining FAO's visibility and media profile, and promoting FAO's virtues and strengths are also crucial corporate activities. Today's public information audiences range from mass media journalists in the developed and developing world to specialist media to the growing number of world citizens who now use social media and other new channels to work for positive social change.

### ■ Awareness-raising and fund-raising campaigns

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*World Food Day (WFD)* is held annually on the 16 October anniversary of FAO's founding, each year with a different theme selected to focus global attention of specific aspects of FAO's work in reducing hunger. For example, FAO celebrated its 50th anniversary in 1995 with the theme "Food for All". In 1999, the theme "Youth against Hunger" highlighted the issues of rural youth, promoting public awareness of their role in the global fight against hunger; in 2000 FAO observed the turn of the millennium with the WFD theme "A Millennium Free from Hunger"; and after the World Food Summit: *five years later* (in 2002), it used the WFD theme to promote the "International Alliance against Hunger".

#### BOX 24

#### FAO media outreach well received

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In 2010 alone, FAO and its efforts to stem world hunger were featured in thousands of newspaper articles, television and radio broadcasts, and online features by news organizations from around the globe, including major international outlets such as Al Jazeera, BBC, CNN, *El País*, *Le Monde*, *The Economist*, *the Financial Times* and *The New York Times*. To help project FAO's messages, FAO issued more than 150 news releases in the Organization's six official languages via the online FAO media centre, and FAO experts gave 500 interviews to the media.



In 2008, when FAO hosted the High-Level Conference on the Challenges of Climate Change and Biofuels, it was carried through as the theme for World Food Day. That was also the year in which the estimated number of hungry people in the world exceeded 1 billion.

It was in this context that Director-General Jacques Diouf launched the *1billionhungry* campaign with a hunger strike that he organized and in which he personally participated. The campaign tallied almost 3.5 million signatures to a global petition calling for political support in the effort to end hunger. In May 2010, the *1billionhungry* project was re-launched and woven into the framework and activities of the October 2010 World Food Day, under the theme “United against Hunger”.

The impact of WFD is felt at country level, with countries carrying out observances and events related to the annual theme. FAO decentralized offices collaborate with partner agencies and other sponsors and arrange field demonstrations, site visits, television talk shows, radio broadcasts, school competitions, cultural and sports events to mark the day.

*The TeleFood Programme* was launched by FAO in 1997 to increase public awareness of global hunger and of the need for action, and to raise money from the public in order to sustain the momentum created by the 1996 World Food Summit.

Through the staging of events, which at the outset were televised, FAO sought to create a constituency to change public opinion and to attract input and support from civil society. Events were designed to raise awareness of the problem of hunger and to provide a mechanism to collect funds directly from the public, which was quite a novelty for a UN technical agency at the time. The collected funds went entirely to finance small projects. None of the funds collected covered FAO administrative costs.

For the most part, TeleFood projects were simple grassroots micro-projects in developing and transition countries, designed to provide sustainable solutions for hunger and poverty by helping families and poor communities produce their own food and generate income. For example, projects set up school gardens and farms

#### BOX 25

### Spain TeleFood events net fans and funds

The most successful long-term TeleFood event, the Spanish “GalaFao” telethon, raised more than US\$15 million. Thanks to the political and cultural situation in Spain in the mid-1990s, and the willingness of Spain’s telecommunication companies to be involved, GalaFao succeeded in keeping the Spanish public informed about FAO’s campaign against hunger while collecting money for small-scale income-generating projects with which Spanish people could identify.

The final edition of GalaFao, on 8 November 2008, attracted some 19 million television viewers, and more than half a million text messages and



34 000 phone calls pledging donations. The live event featured actors, singers, presenters and sports celebrities whose earlier on-site visits to FAO projects in Egypt, Mauritania, Guatemala and Ethiopia were broadcast during the show, helping viewers see exactly how their money had been spent and encouraging them to donate even more. A record US\$3 million was raised during the eight-hour broadcast.

### **Football teams join fight against hunger**

In October 2007, FAO and the Spanish Football League organized an awareness and fundraising campaign named *The Football League with FAO against Hunger*. Launched on that year's World Food Day by Real Madrid Captain Raúl González, an FAO Goodwill Ambassador, it was celebrated in all the stadiums of the first division of the Spanish BBVA football league, with a contest among the league's 42 teams involving text message donations to each team's microproject against hunger.

The success of this event had important repercussions for FAO, when the Spanish football league proposed broadening the initiative to the Association of European Professional Football Leagues (EPFL), which comprises 28 European leagues and more than 900 individual clubs. In 2008, FAO and EPFL signed a cooperation agreement, and that same year similar pacts were concluded with the Confederation of African Football and the South American Football Confederation, thus beginning an important new phase in communications outreach that included further agreements with the Asian Football Confederation, the Fédération Française de Football and the European Commission's Humanitarian Aid Department.

The *Professional Football against Hunger* solidarity campaign was launched in October 2008, to use the emotional power of football as a communication tool to involve European society in the fight against hunger. The first two editions of the *European Match Day against Hunger* were celebrated in March 2009 and October 2010, with the players of 314 professional football clubs pouring out onto the fields of 157 stadiums in 14 countries across Europe, blowing yellow whistles associated with the FAO *1billionhungry* campaign or wearing the campaigns' white and yellow T-shirts. Other football-based events supporting the fight against hunger have been created in Chile, France, Brazil and Angola.

where students could learn how to grow their own crops and breed livestock, at the same time ensuring the availability of healthy school meals prepared with the food they themselves produced. Whenever relevant, projects were closely linked to other ongoing development or rehabilitation activities in the beneficiary countries.

Since its launch, some 130 countries have been involved in TeleFood awareness and fundraising activities, which are often timed to coincide with World Food Day

ceremonies but which are increasingly part of an overall communications programme that stages events wherever and whenever a successful attempt to capture public attention can be made. TeleFood projects have been shown to have a real and positive impact on the life of the beneficiary populations and have proved to be a useful and powerful tool to advocate for the need to fight against hunger and poverty at the community level.

*The FAO Goodwill Ambassadors Programme*, initiated in 1999, has given additional impetus to TeleFood and other advocacy campaigns and initiatives by involving personalities of global stature in both funding appeals and visits to FAO field projects, thereby promoting FAO's specific activities and outreach. By helping to mobilize resources within fundraising projects, the celebrities who work with FAO send a clear message to broad audiences worldwide: food security is an urgent priority.

**BOX 26****Global personalities accept FAO Ambassador role**

The ambassadors have proved to be highly effective in spreading FAO's message to a larger audience than otherwise would be reached. For example, two FAO goodwill ambassadors, Italian football player Roberto Baggio and American Olympic champion Carl Lewis, promoted the FAO–EPFL partnership. Among other celebrities who have been enrolled and helped promote FAO's messages over the years are the late South African singer Miriam Makeba, Italian Nobel prize winner Rita Levi Montalcini, and actress Gina Lollobrigida, New Zealand athlete Beatrice Faumuina, American singers Dee Dee Bridgewater and Dionne Warwick, Mali songstress Oumou Sangaré, Lebanese singer Magida Al Roumi, American Oscar winner Susan Sarandon, Cuban musician Chucho Valdés, Philippine singer and actress Lea Salonga, Mexican rock group Maná, Irish singer Ronan Keating, French stylist Pierre Cardin, Canadian singer Céline Dion and football stars Patrick Vieira and Raúl González.

These envoys support FAO's work by enhancing the visibility of the global fight against hunger and malnutrition, and mobilizing political opinion in support of FAO's objectives. Similarly, they have proved selflessly devoted to attempts to draw public and media attention to emergency or post-emergency issues such as the 2004 Indian Ocean tsunami, the 2008 Chinese earthquake, and the 2010 Haiti earthquake. With their outreach growing through social media and other Internet tools, they also have provided extensive support to the *1billionhungry* campaign and several have been asked to join United Nations Goodwill Ambassadors, to serve as MDG Champions and Messengers of Peace.

## The power of knowledge

Strengthening the knowledge and capacities of individuals is central to fortifying national capacities, but this cannot happen in a vacuum. The organizations and individuals involved also must have the ability to absorb and maintain their new knowledge and capacity and also to anticipate emerging needs.

That is why capacity development addresses three interlinked dimensions: i) improving the knowledge, skills, behaviour and attitudes of individuals; ii) modifying the mandates, priorities, processes and structures of public, private and civil society organizations; and iii) strengthening political will, policy framework and other elements to provide an overall environment that enables capacities to be enhanced and sustained. Meaningful change is achieved when all three dimensions are targeted in an integrated way and interventions are sustained over time, for as long as five to ten years.

### ■ Increased focus on capacity development

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The Paris Declaration on Aid Effectiveness, endorsed in 2005 at a meeting hosted by the French government and organized by the OECD, and the follow-up Accra Agenda for Action, drawn up in 2008, heightened expectations for developing countries to formulate and implement their own development plans, and for donor resources to be more closely tied to results. This has required increasing the capacity of national and regional actors to plan, prioritize and implement programmes. In parallel, capacity development has been given even greater focus by FAO and the international development community since 2005. FAO considers capacity development a “core function”, closely related to knowledge and information sharing, and thus factors capacity development goals into the strategies, programmes and work plans of its technical departments, including decentralized offices.

FAO’s renewed approach to capacity development embraces an important principle: activities must be country-driven and consistent with the member countries’ priorities. Furthermore, it does not seek to “infuse” capacity from the outside but rather facilitates a process of change through which countries enhance their abilities from within. Capacity is developed in partnership, with FAO, its member countries and other key players working together in ways that harness the comparative advantages of each. All this is reflected in FAO’s Corporate Strategy for Capacity Development, finalized in 2010, which was developed through consultation with members and all FAO units worldwide. The strategy incorporates the major findings of the 2010 Evaluation of FAO’s Activities on Capacity Development in Africa. This new corporate approach to capacity development enables FAO to learn from its collective efforts and then provide member countries with support that represents a consensus of the entire organization.

## ■ Revolutionizing impact of Internet

The advent of the Internet in the mid-1990s had a profound impact on FAO as a knowledge organization, enabling it to increase the efficiency and outreach of knowledge-based services on an unprecedented and massive scale. Previously, obtaining access to an FAO technical document or to a set of agricultural statistics could take days, if not weeks. Today, with Internet and FAO's online virtual libraries and up-to-date statistical databases, searches and queries can run directly through the FAO Web site facilities.

The Internet has also revolutionized FAO's outreach. It is hardly surprising that over the past 15 years, the FAO Web site has become FAO's primary mechanism for disseminating multilingual technical information, data and knowledge to all its member countries. The site received 774 000 user visits in 1997, 5.5 million in 2000 and 28 million in 2005, with more than 43 million user visits projected for 2011.

FAO's online document repository is an important function of the Web site, providing access to more than 36 000 publications. Progress has been made in the language balance of information and publications disseminated by FAO, with the Web site and the document repository allowing for coverage in Arabic, Chinese English, French, Russian and Spanish as well as non-official languages for selected works.

## Tapping and sharing tacit knowledge

While FAO has invested significant resources in improving online access to explicit knowledge that can be expressed in documents or in databases, this is only one aspect of FAO's work as a knowledge organization. Today, FAO devotes increasing attention to improving access to and sharing of tacit knowledge, meaning the knowledge, expertise, experience and best practices, particularly from the field, which are "trapped" within the heads of experts or confined to a small circle of individuals. In 2009, the Rome-based agencies (FAO, IFAD, WFP and Bioversity



PHOTO 16

Users can run their own queries using FAO's online statistical and geospatial databases.

International) as well as the knowledge management programme of the Consultative Group on International Agricultural Research (CGIAR), organized an innovative knowledge “Share Fair” to enable staff members to showcase their experience and learn new ways for sharing knowledge and improve access to it. The 1 000 participants who attended were able to share and learn from each other’s good practices; experiment with various tools and methodologies for knowledge sharing, including blogs and wikis; and create links and networks for future collaboration between and within the organizations. Since then, more than 2 270 people have attended eight share fairs around the world in locations including the Niger, Colombia, Mexico and Ethiopia.

### **Social media**

***Supporting knowledge exchange.*** Knowledge management is fully mainstreamed into FAO’s work. Social media are proving to be useful tools for FAO’s technical work. For example, FAO supports the global e-Agriculture Community of Practice which has more than 7 000 members from 200 countries who focus on improving the use of ICTs in rural and agricultural development. Community members use the interactive community Web site developed by FAO and social media to facilitate information exchange and online conversation.

The Community’s Twitter account, which has more than 2 500 followers, is its most frequently used social media channel. Its “tweets” have been picked up by a wide range of interested people, including university students, other UN agency staff and news correspondents. Twitter also brings new information quickly to the community through conversations arising from other Twitter users. Through Facebook, the e-Agriculture Community shares selected news and information, increasing awareness of the larger set of materials available on [www.e-agriculture.org](http://www.e-agriculture.org). The community also benefits by learning from news and information shared by younger people who would not normally be exposed to the e-Agriculture Community.

***Supporting advocacy.*** The emergence of social media radically changed the game for public information and corporate communication, not to mention for advocacy. FAO established its presence in several key networks starting with YouTube in late-2007, followed by Facebook, Twitter and Flickr at the start of 2009. These four are still the leading channels of engagement, but FAO is also involved in a number of newer networks including “giving” sites such as Jumo and Ammodo.

To take best advantage of social media while also mitigating risks, FAO has developed flexible policies for its departments and staff. The guiding principle is to help FAO benefit from social media tools while also protecting and enhancing its corporate public image. FAO publications, videos, databases, reports, news releases, photography and other multimedia assets are shared with both traditional media outlets and interested individuals, who increase in number every day.

The *1billionhungry* project advocacy campaign broke new ground for FAO communication in several senses, not least for its heavy reliance on social media. For the

campaign's 2010 season, *1billionhungry* project accounts were established on Twitter, Facebook, Flickr and YouTube, which enabled the campaign to welcome partners and partner content, but more importantly to attract a new, younger and less technical public. Still in evolution, the *1billionhungry* project demonstrates that social networks are powerful opportunities not only for sharing knowledge but also for building solidarity and influencing public opinion.

The significance of social networks to FAO's objective of a world without hunger cannot be overstated. Now more than ever, there is a growing awareness that it may be individual people who will ultimately make the difference and bring an end to hunger. Humanity may be nearing a tipping point, where a critical mass is no longer willing to accept the presence of chronic hunger, poverty and other gross inequities. The challenge for FAO in the near future will be to align its communication resources and approaches so as to find, inform, cultivate and energize that critical mass.

### **Facilitating access to scientific journals**

To assist member countries' education and research institutes in accessing current technical and scientific knowledge, since 2003 FAO has worked with more than 60 commercial publishing houses to establish AGORA (Access to Global Online Research on Agriculture), an innovative Web-based portal that enables developing country users to access specialized journals at little or no cost. AGORA is part of the Research4Life initiative, in which a number of UN agencies, with different fields of specialization, are participating. The journal publishers rely on the UN agencies to regulate access to their content via authenticated Web portals or gateways. To date, more than 2 500 institutions from the public domain and civil society of 107 countries have registered for AGORA.

### **■ Supporting knowledge sharing**

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In addition to producing and disseminating knowledge and statistics, FAO will strive to facilitate access to knowledge wherever it may reside, with special attention to making knowledge freely available, especially for the LDCs. In this emerging role, FAO will become a strategic reference point to improve connections between those who have access to knowledge and those who need it. This will be done through a variety of means, such as capacity development in knowledge-sharing approaches and the strengthening of thematic knowledge networks.

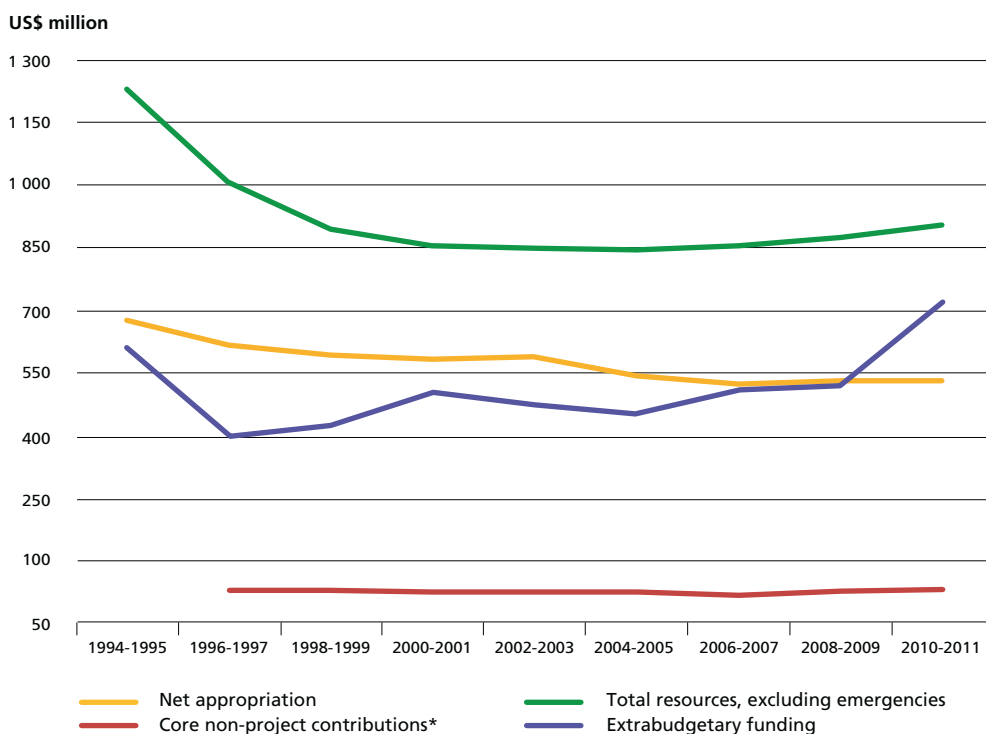
Achieving a level playing field between developing countries and the developed world requires significant investment and adjustments to the world trading system. However, it also requires equal access to vital knowledge and information, an area in which FAO can make a major contribution. This rapid development of ICTs suggests that more and more farmers, pastoralists, fishers, foresters as well as researchers and other practitioners in developing countries will be able to access that information and knowledge at a relatively affordable cost.

## Strategic development and organizational reforms

From 1994 to 2010–2011, the resources of FAO's Regular Programme (funded through member countries' assessed contributions set at its biennial conference) declined by 21 percent, while the Organization's total amount of financial resources, including voluntary contributions but excluding emergency assistance) declined by 26 percent in real terms. During the same period, FAO has been consistent and vigorous in its efforts to use funds efficiently. It has achieved sustained efficiency savings of US\$111.9 million per annum by reducing spending on inputs and operating processes and through cost-recovery measures. Figure 24 shows the evolution since 1994 of the total resources available to FAO in real terms. Resources are broken down into the net appropriation (Regular Programme budget) approved every two years by the FAO Conference and additional extrabudgetary voluntary contributions from members and partners.

FIGURE 24

### Trends in FAO resources since 1994 (in real terms)



\* Called "Other income" before 2010.

Significant savings have come from a 30 percent reduction in staff members, from 5 560 in 1994 to 3 877, considering staffing under all sources of funds as of April 2011. Recognizing that staff is FAO's most important resource, in 2008 the Organization adopted a human resource strategy aimed at generating a favourable environment for attracting and motivating a top-level workforce. Staff members have also been moved to the field, putting them closer to project operations while lowering cost and allowing for a better response to the needs of countries.

In November 2009, the FAO Conference voted a Regular Programme budget of US\$1 billion for the 2010–2011 biennium, with additional voluntary contributions estimated at US\$1.2 million, to achieve a unified programme of work. This represented a slight increase in real resources at the disposal of the Organization, reflecting the magnitude of the challenges to be addressed in food and agriculture and the increased effectiveness of FAO through progressive reforms.

### ■ Reforms beginning in 1994

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Following the appointment of a new Director-General on 1 January 1994, a significant series of reforms took place in the mid-1990s. This initial reform process was followed a decade later by a further set of reforms which, although complementary, were also in response to a period of severe budgetary stringency.

The first reforms involved a reappraisal of the Organization's priorities. There was a compelling need to refocus work to address food security concerns more incisively. The Special Programme for Food Security (SPFS) was launched (see detailed section on the SPFS in Chapter 6) and its scope was soon broadened from small-scale practical demonstrations designed to boost food production at the field level to encompass policy assistance in the formulation of comprehensive food security strategies at the national and regional levels. This consolidated the valuable work done by FAO in connection with major threats to crops and animal production systems, and the Organization's governing bodies accepted that this work should converge. The result was the launch of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES).

In order to improve the coherence of FAO services to member countries, a key structural change was made at headquarters to group previously scattered units into a Technical Cooperation Department. This enabled a smooth transition, in subsequent periods, to reach the situation of largely decentralized responsibilities for project operations and policy services, which remains FAO's prevailing model. Finally, steps were taken, first to strengthen the five regional offices by positioning stronger multidisciplinary teams in them; and second to expand outreach to groups of countries not well served by these regional offices by establishing subregional offices. The scope of this essential innovation was restricted to five geographical areas, again owing to budgetary limitations.

Other changes to FAO's way of doing business included administrative streamlining and the introduction of new partnership modalities to procure expertise. Among the latter was the use of experts from developing countries to deliver tech-



nical assistance to other developing countries. This had the added advantage of much lower costs than using internationally recruited experts, thereby helping FAO to cope with the cap put on its regular budget imposed by the governing Conference.

Close to the end of decade, in November 1999, the Conference adopted a new blueprint for action: the *Strategic Framework for FAO: 2000–2015*, formulated by the secretariat and based on extensive consultations with member countries and a broad range of partners. This was the first time since the founding of FAO that the governing bodies and the secretariat were able to share a common vision around a limited number of focused, long-term objectives.

### ■ Reforms of 2005

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A second set of reforms was proposed to the governing bodies in 2005. These were aimed at equipping the Organization to play an increasingly effective role in assisting its Members in specific areas of its mandate and in contributing to the broader effort by the UN system to achieve all the MDGs. The Organization's programmes were redefined to reflect more accurately the three major thrusts of its work in the areas of sustainable food and agricultural systems; knowledge exchange, policy and advocacy; and decentralization, UN cooperation and programme delivery. More effective means of action were put in place, including the following:

- Organizational measures and new financial incentives to enhance multidisciplinary work in such key areas as knowledge management (giving a boost to major contributions by FAO to the advancement of rural and agricultural development in the world through the generation and dissemination of knowledge) and capacity building; or in relation to serious emerging challenges such as the implications of climate change on agriculture, fisheries and forestry, and bioenergy.
- More effective clustering of technical responsibilities in essential areas by placing them under the same roof: i) nutrition and consumer protection – concerns that were the object of much greater international attention – were more closely integrated with agriculture within a more inclusive “farm to table” approach; and ii) a dedicated department was set up to enable natural resource management and environmental issues to be handled in a holistic manner.
- A further, gradual expansion of subregional offices, staffed with specialists in disciplines that closely matched local requirements.
- A drastic reduction in the number of units and locations at which administrative actions were processed resulted in economies of scale as well as reduced overhead costs. This led to the creation of a shared services centre, based in Budapest, Hungary. The choice made it possible for FAO to benefit from favourable cost differentials, compared with the headquarters location in Rome. This major initiative in the administrative area was coupled with further delegations of authority to the decentralized offices.

- Reinforced monitoring, evaluation and oversight of all of FAO's programmes.

### ■ Independent external evaluation of 2006–2007

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The first-ever independent external evaluation (IEE) of FAO in its 60-year history took place in the 2006–2007 period. Commissioned by the FAO Conference in November 2005, the evaluation was undertaken by a fully independent team of consultants from around the world. Findings and recommendations were submitted to the FAO Conference session held in November 2007.

The IEE sought to respond to four basic questions:

- What is the appropriate role for FAO in an international development architecture that is vastly different from 1945 when the Organization was founded?
- What are the needs of FAO's constituents and what are its comparative advantages? What is currently required to ensure the maximum relevance and effectiveness of FAO's normative and technical cooperation programmes?
- Are FAO's management and administrative practices and its organizational culture and structure sufficiently flexible and fit for modern times?
- Is the governance of the Organization exercising its dual roles of contributing to global governance and ensuring an effective and relevant FAO with the ownership of all members?

One of the most telling conclusions of the IEE was that: “the world needed FAO, but a reformed FAO to address the challenges our planet faces”. The authors confirmed that only FAO provided the global forum for food and agriculture and brought together the full range of technical disciplines to integrate the technical and policy response in addressing agriculture's challenges in the 21st century. However, while the evaluation underlined a number of issues that needed to be addressed urgently by both governing bodies and the secretariat, the authors stressed that this necessary renewal should be predicated on “Reform with Growth”, which requires both substantive reforms in the directions discussed in the evaluation and additional resources. The two must move hand-in-hand and neither would be possible without the other.

While the report of the IEE and the Director-General's management response was welcomed by the FAO Conference in 2007, much work remained to be done to translate its extensive findings and recommendations into an effective, operational programme of change. It established a Conference Committee, which worked intensively during 2008 to develop an Immediate Plan of Action for FAO Renewal (IPA), which was adopted by a special session of the Conference in November 2008. The implementation of the ambitious set of changes the IPA embodies, the most far-reaching ever attempted in a UN institution as large and complex as FAO, is taking place over the five years from 2009.

## ■ FAO renewal – an ongoing progress

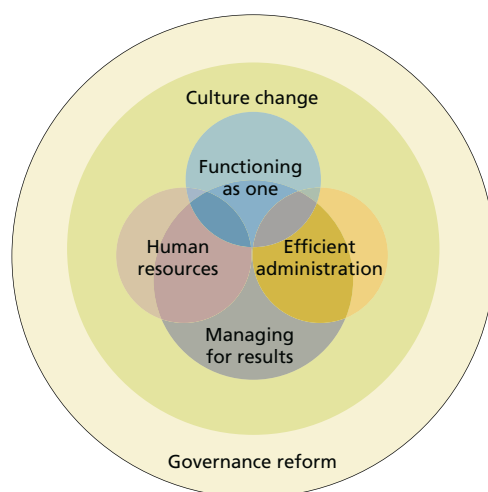
At the time of writing, significant progress has been made in the implementation of the IPA and starting to realize the benefit from the reforms, through which FAO will:

- direct all actions towards clearly defined outcomes for a world free from hunger and contribute to improving living standards in a sustainable manner, achieving this through improved governance to ensure clarity of members' needs and improved internal management practices to deliver against those needs;
- ensure that all its resources, at all geographic locations, work in synergy and in productive partnership with external partners to achieve the greatest impact;
- have a balanced and motivated workforce working in an enabling environment with the necessary knowledge and experience to deliver better against its mandate;
- benefit from support services that are client-oriented and streamlined and be able to provide timely and trusted financial and other resource information, in the most cost-efficient manner.

The high level framework of the IPA Programme (Figure 25) includes six thematic areas, each with its own set of major IPA actions and associated benefits. The completion of IPA actions in all thematic areas will deliver the overall FAO reform benefits.

FIGURE 25

### Six thematic areas of FAO reform



**BOX 27****Members define FAO's vision and global goals****Vision**

- A world free of hunger and malnutrition where food and agriculture contributes to improving the living standards of all, especially the poorest, in an economically, socially and environmentally sustainable manner.

**Three global goals**

- Reduction of the absolute number of people suffering from hunger, progressively ensuring a world in which all people at all times have sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
- Elimination of poverty and the driving forward of economic and social progress for all, with increased food production, enhanced rural development and sustainable livelihoods.
- Sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources, for the benefit of present and future generations.

**Managing for results**

The target benefit for managing for results is a clear and measurable impact of FAO's products and services on beneficiaries. In order to accomplish this benefit, FAO's work under all sources of funds must be systematically planned, implemented, measured and monitoring using results-based management principles. This requires successful completion of two elements: the clear articulation of members' objectives and, within this context, the design and delivery of measurable results with clear impact.

Starting in 2010, a new results-based framework was put in place to shape the design of all programmes as well as underlying processes for priority setting and resource management. The focus is no longer on what FAO does, but on the impact of its activities on constituents, both nationally and globally. The new Strategic Framework for FAO: 2010–2019 articulated the vision and the global goals sought by its members, to be implemented through a four-year Medium-Term Plan with indicators and targets for achievement, and a two-year programme of work and budget.

**Functioning as one**

The target benefit of functioning as one is that all the resources of the Organization at all geographic locations, and external partners, work in synergy and complementarity to achieve Organizational results within the results-based framework. To

deliver this Organizational benefit, FAO must have all its resources work in synergy across geographic boundaries with an improved balance between Headquarters and Decentralized Offices in delivering FAO services and across institutional borders, and by achieving an improved collaboration between FAO and partner organizations in delivery of Strategic Objectives, based on comparative advantage.

A new headquarters structure was put in place at the beginning of 2010, with a view to: ensuring manageable spans of control; consolidating units where feasible and reducing potential “silo” effects; and introducing flexible, delayed modalities at lower levels. The long sought-after fuller integration and representation of decentralized offices in senior management decision-making processes is now a reality. At the same time, FAO’s Regional Conferences have increased their participation in the decision-making process of the Organization. Through the delegation process, Regional Offices have improved the coherence of the decentralized offices network, strengthened their overall monitoring function and provide timely support to country offices. Technical Cooperation Programme (TCP) resources have been allocated to regions under the authority of the Regional Representatives – the TCP was introduced in the 1970s under FAO’s regular budget as a flexible, fast-response facility to meet urgent requests for assistance by countries.

### **Human resources**

The target benefit for human resources reform is to ensure an enabled, effective and motivated workforce better able to deliver FAO’s mandate. Achieving benefits in this area means that FAO’s staff must be balanced in its demographics, nationality and gender, and its knowledge and experience must be broadened and targeted to achieve agreed organizational results. These benefits are being progressively realized through the corporate human resources strategic framework put in place in 2008.

Preparatory work is now complete with respect to improved demographic composition, through the work undertaken with the Junior Professional Programme, and actions taken to improve gender and geographic balance. There is an expected benefit of rejuvenation of FAO’s workforce over time by recruiting younger professionals from non-represented and underrepresented developing countries, by prioritizing the correction of gender imbalances and by focusing on the needs of decentralized offices – especially at the country level. The initiatives on gender balance are achieving concrete results.

FAO will improve its staffing capacity in knowledge and experience through progressive increases in resources allocated to staff training, especially management training. This training will be reinforced by the completion of the competency framework and improved recruitment procedures as well as by introducing robust performance management processes and systems and increasing staff mobility between different offices and functions of FAO. The introduction of a Performance Evaluation Management System (PEMS) in 2010 has supported the objective of improving accountability and performance across FAO, and PEMS implementation represents a concrete change in the way the Organization works because, for

the first time, staff are linking objectives of their daily work to those of the Organization.

### **Administrative efficiency**

The target benefit of efficient administration is better delivery of FAO technical services through client-oriented and streamlined administrative processes, improved value and relevance of financial and other resource information, and innovative administrative service delivery options. To deliver this organizational benefit, it is necessary to focus on three areas: i) efficient administrative processes need to be obtained through an improved alignment of administrative services with the support required for more effective delivery of technical services; ii) administrative information must ensure an improved availability and scope of financial and other resource-based information; and iii) service delivery options must introduce innovative mechanisms that result in more efficient administration services.

This area of reform brings together the largest and most complex projects. These projects are well under way, and efficiency benefits will begin to be delivered in a significant manner during 2012 and 2013. Benefits already achieved under this thematic area include efficiency savings and standardization across the Rome-based agencies resulting from the successful tendering activities by the Common Procurement Team. Furthermore, improved focus on streamlined and customer-focused administrative services is provided by the Business Improvement Unit. Improvements in management information systems and telecommunications, particularly in human resources and financial reporting, have brought managers in decentralized offices as well as headquarters a wide variety of much-improved financial and human resources information.

### **Culture change**

The target benefit in the area of culture change comes from creating an enabling, inclusive work environment which allows the Organization to optimize the talents of its employees and accomplish its mandate more effectively. This is an ongoing process with tangible benefits now being realized. Evidence that culture change is occurring is can be seen through the proliferation of local culture change teams and a significant increase in departmental and cross-departmental knowledge sharing. Through these new mechanisms, employees have opportunities to voice ideas, opinions and influence change in their locality, leading to more participatory decision-making processes at various levels as well as a dynamic working environment.

### **Governance reform**

The target benefit of governance reform and oversight is to provide the strengthened governance framework required by the FAO reform process in order to be fully successful. The governing body reform will result in a more inclusive, open and trusting system of member governance and will ensure that the internal governance

provides a more effective oversight, including learning and accountability through evaluation, to enhance overall performance and improve management of resources. Benefits have already been achieved under several of the IPA actions affecting this area, as a more open and transparent governance process has been achieved through the presence of silent observers at sessions of the Finance and Programme Committees and the Committee on Constitutional and Legal Matters (CCLM).

## Conclusion

FAO's programmes and activities to eradicate world hunger have evolved over time in response to countries' needs as well as the challenges faced by the Organization and its members and partners. Policy advice, one of FAO's most critical functions, has evolved accordingly. In addition to developments introduced with a series of organizational reforms carried out since 1994, the more recent global food, fuel and financial crisis awakened FAO to the need to increase its policy support to member countries in order to ensure that they had policies in place to accommodate new challenges.

In addition to supporting countries in their policy formulation, FAO also has focused on increasing public awareness of hunger issues, thus encouraging the world's citizens to keep pressure on developed and developing countries to establish and fund the policies and actions needed to support the agriculture sector.

This has included the following:

- supporting gender-sensitive policies aimed at achieving gender equality by illustrating constraints faced by rural women and action needed to close the gender gap;
- working to improve people's access to land and natural resources through a focus on land-tenure governance;
- increasing partnerships with CSOs and NGOs, involving them more at the policy level;
- disseminating FAO's messages to the public through traditional and social media and involving the public through awareness-raising and fund-raising events;
- developing capacities of individuals, governments and organizations;
- reforming the activities of FAO itself in order to ensure it responds to member countries' needs effectively and efficiently.

FAO has considered policy advice a core activity since its inception, an understanding increasingly supported by member countries who consider policy assistance and capacity building FAO's two areas of greatest priority.

## CHAPTER 6

# FAO in action: past, present and future

For more than six decades, FAO has called on its broad technical expertise and experience to address a wide range of global issues related to food, nutrition, agriculture, rural development and the management of natural resources. FAO's actions to support members in combating hunger and malnutrition have been and continue to be many and varied, both in the field and in the normative and policy arena. Selected activities, reflecting the Organization's core functions and global goals, are highlighted in this chapter.

## Negotiating international instruments

Throughout its history, FAO has been involved in the development and implementation of international instruments – some legally binding, some voluntary – that establish minimum requirements, standards, norms and best practices for the food and agriculture sector. FAO's constitution calls on the Organization to provide a neutral forum, where its members can negotiate international instruments. FAO's reputation for neutrality and its knowledge baseline constitute a comparative advantage in this area, and it is increasingly recognized by the global community.

In recent years, FAO has responded to a significant number of requests to develop international instruments from its members, statutory bodies and international organizations such as WTO and the United Nations General Assembly.

Developing international instruments on food and agriculture under the aegis of FAO has added value because the negotiation process can draw directly on FAO's vast information base and technical capacity. FAO provides direct technical input by hosting most of the negotiation meetings while also acting as the meeting secretariat. Relying on its technical expertise and practical experience, FAO ensures that the international instruments are not only legally and technically sound but that they also respond to prevailing needs, address recognized priorities and provide the framework for the continued engagement of the relevant parties and partners to address future challenges.

FAO's role does not end at the closure of negotiation processes. The effective implementation of international instruments is crucial for generating positive effects on food security, food safety and sustainable management of natural resources. Effective implementation of globally endorsed standards, obligations and best practice at the national level depends largely on national capacities, which are inadequate in many developing countries. In addition to assisting member countries



PHOTO 17

Plant genetic resources are the raw material that farmers and plant breeders use to improve the quality and productivity of agricultural crops.



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in developing these capacities, including through the review and development of national legislation, FAO helps countries formulate policies that reflect globally established minimum requirements and recognized best practices to address national priorities and needs.

### ■ Binding instruments

***Port state measures agreement: a binding instrument to fight illegal, unreported and unregulated fishing.*** Illegal, unreported, and unregulated (IUU) fishing jeopardizes the livelihoods of people around the world and threatens marine resources, in particular fish stocks. While it is relatively easy for fishing vessels to avoid fisheries enforcement authorities on the open seas, they cannot avoid landing their catches in port because they need to access markets. Strengthening the authority of port states to deny fishing vessels engaged in IUU fishing access to their ports, or to deny their use of the port to refuel, resupply or land fish, is an effective means to intercept IUU fishers before they can sell their produce.

Recognizing FAO's mandate in dealing with global fisheries issues, in 2005 the UN urged FAO's Committee on Fisheries (COFI) to develop an instrument using port state measures to fight IUU fishing. After intense negotiations from June 2008 to August 2009, the FAO Conference approved the binding *Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing* in November 2009. The Agreement will enter into force 30 days after the twenty-fifth instrument of ratification, acceptance, approval or accession has been deposited. The widespread application by coastal states of a minimum set of uniform measures under the agreement will help fight the scourge of IUU fishing.

***International Treaty on Plant Genetic Resources for Food and Agriculture: the first operational access and benefit-sharing scheme.*** Plant genetic resources for food and agriculture are crucial in feeding the world's population. They are the raw material that farmers and plant breeders use to improve the quality and productivity of agricultural crops. The future of agriculture depends on international coop-

eration and on open exchange of the crops and their genes that have been adapted, improved and shared by farmers since farming began more than 10 000 years ago. Continuing this exchange of plant genetic resources among farmers, and also among countries, is essential for food security.

Responding to the need to guarantee future access to plant genetic resources for food and agriculture, FAO initiated negotiations for the International Treaty on Plant Genetic Resources for Food and Agriculture in 1994. The Treaty was adopted by the FAO Conference in 2001 and entered into force in June 2004. It currently has 127 contracting parties who have committed to the conservation of plant genetic resources, the sustainable use of these resources and the equitable sharing of the benefits derived from their use.

At the heart of the Treaty is a multilateral system of access and benefit sharing, which facilitates access to the world's 64 most important food and forage crops as well as to some of the world's most important *ex situ* collections of plant genetic resources. The crops covered by the multilateral system produce 80 percent of the food derived from plants.

The multilateral system facilitates access to plant genetic resources for research, breeding and training for food and agriculture, either free or at minimal cost. The precise conditions for access to plant genetic resources covered by the system are governed by the Standard Material Transfer Agreement, which was approved by the Treaty's governing body in 2006. With a global gene pool of more than 1.5 million samples of genetic material, more than 800 accessions are transferred daily through the multilateral system.

If material that is accessed through the multilateral system is incorporated in new plant genetic resources and those resources are commercialized, with restrictions on further research and breeding, the recipient agrees to pay 1.1 percent of gross sales (minus 30 percent) into an international benefit-sharing fund which is under the direct control of the Treaty. Voluntary contributions to the fund have already enabled FAO to carry out a number of small-scale projects. e.g. for the *in situ* conservation and sustainable use of plant genetic resources in developing countries in 2009. In 2009, further capitalization of the fund enabled the implementation of a significant number of larger projects, focused on the use of plant genetic resources for adaptation to climate change.

***International Plant Protection Convention: stemming the introduction and spread of plant pests.***

As international travel and trade reach historic levels, and more people and commodities move around the world than ever before, more organisms that can pose risks to plants travel with them. Pest introductions and outbreaks cost governments, farmers and consumers billions of dollars every year. Once pest species are established, their eradication is often impossible, and controlling them accounts for a significant proportion of the cost of producing food.

The *International Plant Protection Convention* (IPPC) provides an international framework for plant protection. Activities include the development of international standards for phytosanitary measures aimed at protecting plant resources from pests

of plants. The IPPC is the only recognized global phytosanitary standard-setting organization and is formally recognized as such by the WTO in relation to trade in all plants and plant products. It enables countries to analyse risks to their national plant resources and to use science-based measures to safeguard their cultivated and wild plants.

The IPPC also helps protect farmers from new, economically devastating pest outbreaks. It facilitates the protection of: i) the environment, against loss of species diversity; ii) ecosystems, against loss of viability and functions as a result of new pest invasions; and iii) of industries and consumers, against the costs of new pest management or eradication. The IPPC facilitates trade and minimizes disputes by providing international standards for the harmonization of phytosanitary measures, and it provides capacity-development opportunities in support of their implementation.

### ■ Non-binding instruments

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***Right to Food guidelines: consensus on the meaning and implementation of the human right to adequate food.*** Although the human right to adequate food has been firmly established in international law for decades, there was previously little understanding and no consensus about the implications of this right for different areas of state policies, laws and institutions. In 2004, the FAO Council unanimously adopted the *Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security* to bring clarity to the meaning of the “right to food” and to provide practical guidance on its implementation. The guidelines have been accepted by all FAO members and constitute the current international consensus on the right to adequate food.

The drafting and adoption of the guidelines followed a decision by the World Food Summit: *five years later* in 2002 and, subsequently, two years of negotiations by a special intergovernmental working group established under the CFS. The process was a major development in the field of socio-economic rights and it allowed all FAO and UN member countries and civil society to debate questions related to the right to food in detail.

The guidelines are a human rights tool. They are not legally binding, although they build on international law and provide guidance on implementation of existing obligations. They apply to all states, parties and non-parties to the *International Covenant on Economic, Social and Cultural Rights*, including developing and developed countries.

The guidelines address a number of policy areas of relevance to the realization of the right to food and stress the importance of institutional, legal and policy coherence and coordination. They emphasize a wide range of principles including equality and non-discrimination, participation and inclusion, accountability and rule of law, and the principle that all human rights are universal, indivisible, interrelated and interdependent. They also seek to strengthen good governance and the rule of

law. Throughout, the guidelines encourage a gender perspective and stress equal rights of women as well as special protection for pregnant women and mothers.

***Code of Conduct for Responsible Fisheries: a living guide for all stakeholders.*** Fisheries and aquaculture are important sources of food, employment, income and recreation for millions of people throughout the world. To guarantee access to fish for future generations and respond to the call for new concepts for responsible conservation, management and development of fisheries, FAO initiated negotiations for a non-binding Code of Conduct for Responsible Fisheries in the early 1990s. The negotiations resulted in the adoption of the code in 1995 by the FAO Conference.

The Code is the one broad international fisheries instrument that provides an overarching framework for the development and management of fisheries and aquaculture. It sets out principles and international standards of behaviour for responsible fishing and aquaculture practices, with a view to ensuring the effective conservation, management and development of living aquatic resources with due respect for the ecosystem and biodiversity. It recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned in the sector.

The Code has also provided the inspiration and foundation for the development of other fisheries and aquaculture instruments, including the adoption of international plans of action such as the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. It has also formed the basis for a range of international guidelines, including those relating to bycatch and discards, the management of deep-sea fisheries on the high seas, ecolabelling and aquaculture certification.

Although the Code is a non-binding instrument, many of its elements are based on international law. It has been used as a checklist for the review and development of national policies and legislation, as evidenced by the numerous references to it in such instruments and by the compliance of these instruments with the provisions in the Code. Since its adoption, the fisheries sector has made considerable progress in areas such as strengthened fisheries monitoring, control and surveillance, improved fish food safety and quality assurance systems (including traceability and ecolabelling schemes) and sustainable aquaculture.

***Pesticides code: application of a revitalized global instrument for the management of pesticides.*** In many parts of the world, pesticide use remains a major concern regarding food safety, environmental contamination and the health of farmers. Pesticide legislation is often incomplete or hard to implement because of constraints in human resources. The intensification of production and climate change exacerbate pest pressure, which, in turn, leads to steady increases in pesticide use – and abuse. International trade in pesticides and in agricultural products treated with pesticides make pesticide management an area that requires international coordination.

**PHOTO 18**

Production intensification and climate change exacerbate pest pressure.



For more than 25 years, FAO has provided an international forum for ensuring a coordinated approach to strengthening the regulatory framework for the control of pesticides. The backbone of this work is the International Code of Conduct on the Distribution and Use of Pesticides, which was adopted in 1985 by the FAO

**BOX 28****Pesticide control in action**

An example of how FAO is assisting countries in reducing risks from the use of pesticides is its close collaboration with the member countries<sup>1</sup> of the *Comité permanent Inter-États de Lutte contre la Sécheresse dans le Sahel* (CILSS). Working with CILSS, FAO supported the establishment of the *Comité Sahélien des Pesticides* (CSP) in 1994, establishing common legislation and pesticide registration processes among member countries. Legislation and registration of pesticides in the CSP member countries is now exemplary, although capacity development is needed to strengthen enforcement of regulations controlling post-registration of pesticides. This harmonized system remains a model in the developing world, which many other country groupings hope to emulate.

In addition, successful projects have been implemented in CSP member countries that: promote integrated pest management (IPM), monitor the environmental impacts of pesticides, remove obsolete pesticides, control pesticide stock movements, decontaminate pesticide polluted sites and recycle pesticide containers. These initiatives help farmers to: intensify crop production using sustainable methods; produce safer food for domestic and export markets; protect the environment – including international waterways – from contamination; and benefit from lower input costs.

<sup>1</sup> Burkina Faso, Cape Verde, Gambia, Guinea-Bissau, Mali, Mauritania, the Niger, Senegal, Chad.

Conference and revised in 2002. The pesticide code establishes voluntary standards of conduct for all public- and private-sector entities engaged in or associated with the distribution and use of pesticides, particularly where national legislation to regulate pesticides is inadequate or absent. Adopted by all major stakeholders, including national governments, the pesticide industry, civil society groups and international organizations, it continues to provide the international benchmark for sound pesticide management.

The support provided by FAO through implementation of the pesticides code and specific technical assistance in capacity development have contributed to a significant reduction in the availability and use of highly hazardous pesticides, more sustainable crop protection, decreases in farmer poisoning, decreases in environmental contamination, improved food safety and enhanced international trade in agricultural commodities.

## Supporting investment in agricultural development

FAO supports country investment in agricultural development through investment planning, led by its FAO Investment Centre Division. Established in 1974, the Investment Centre works in partnership with countries and both public and private financing institutions to increase the efficacy and flow of external, domestic and private investments to agriculture and rural development. Its role is to bring FAO's knowledge to bear on each step of the investment process. The Investment Centre, supported by FAO's technical and policy divisions, helps developing and transition countries prepare long-term agricultural investments, create synergies between investment programmes, define and strengthen national capacities and design specific investment programmes and projects intended to bring the greatest environmental, social and economic benefits to the lives of rural people.

FAO recently formalized its extensive, long-term investment support to developing countries and countries in transition under its strategic objective of “increased and more effective public and private investment in agriculture and rural development”. It helps governments to attain economic growth, food security and improved rural livelihoods through sustainable and quality-assured investments that are in line with national priorities.

### ■ Investment partnerships and initiatives

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#### International financing institutions

Since 1964, FAO has established cost-sharing agreements with some 27 development financiers. Most operations under these agreements are carried out by its Investment Centre. Each year, the Centre delivers technical expertise in investment planning and project formulation to some 100 countries through more than 700 missions, in partnership with the principal international financing institutions

(IFIs). Over the last decade, this work has resulted in about US\$3 billion being approved annually for investment projects for member countries. In 2010, this figure rose dramatically to US\$5.6 billion, reflecting both the rising loan portfolio of some financing partners and the approval of a few particularly large irrigation development loans in South Asia.

Since 1964, under FAO's Cooperative Programme with the World Bank, the Centre has provided upstream and technical assistance to World Bank-funded operations, covering a wide range of development activities in the agriculture and rural sector. During the last decade, this collaboration has helped to mobilize some US\$900 million in World Bank Group commitments annually and has directly contributed to one-third of its financing to the agriculture sector.

Since 1977, the Investment Centre has also managed a busy programme of work with IFAD, which includes the provision of the Centre's technical support to IFAD field operations, and the provision of IFAD's financial support to activities undertaken by FAO's technical divisions in areas of common interest. From 1994 to 2010, IFAD approved 150 operations prepared with Investment Centre expertise.

### **Regional development banks**

FAO also has a long history of engagement with the regional development banks. During 1968 to 2007, the African Development Bank (AfDB), a major FAO partner, approved 159 projects prepared with Investment Centre assistance and valued at more than US\$3.7 billion, representing about 25 percent of its support to the sector. Since the 1970s, through collaboration with the Asian Development Bank (ADB), the Centre has contributed to 51 operations approved for total investments of over US\$2.6 billion for 15 countries in the Asia and Pacific region. From 1970 to 2010, 23 projects were approved by the Inter-American Development Bank for Latin American and Caribbean countries while, in the Near East and North Africa region, the Islamic Development Bank has been an important financier of investment projects prepared by the Centre.

FAO's role with the European Bank for Reconstruction and Development (EBRD) differs from its relationship with other IFIs because EBRD investment projects are formulated by the investor. Thus, the Investment Centre focuses on the identification of investment opportunities, public-private sector dialogue, sector reviews and improvement of linkages between agribusiness and primary agriculture. In coordination with the EBRD and the World Bank, the EastAgri Network, hosted by FAO, was also created to exchange best practices and lessons learned on agricultural and agribusiness investment activities in Eastern Europe and the CIS region.

Other FAO investment financing partners include the subregional development banks, Arab funds, the Global Environment Facility, bilateral donors and the governments themselves.

### **Africa**

FAO has been a strong partner with the African Union in the conceptualization and subsequent implementation of the Comprehensive Africa Agriculture Development



Programme (CAADP), which is Africa's first coordinated continental approach to agriculture development. Key outcomes of the CAADP were approved by African heads of state in Maputo in 2003, including an agreement to commit at least 10 percent of their national budgets to agricultural development and to achieve at least 6 percent annual growth in the sector. While these budget allocation and growth targets remain elusive for most of the signatories, 24 countries have completed their CAADP Country Strategic Compacts, of which about 20 have also prepared Country Agriculture Investment Plans.

### **L'Aquila**

FAO has supported the design and implementation of the Global Agriculture and Food Security Programme (GAFSP), a US\$925 million grant fund stemming from the 2009 G-8 Food Security Conference, held in L'Aquila, Italy. On this occasion, world leaders committed more than US\$20 billion for sustainable agriculture over three years. Known as the "L'Aquila Food Security Initiative", the commitment was endorsed by 27 countries and 15 international organizations. Since its adoption, FAO has assisted four African countries in receiving significant GAFSP grants, including Rwanda (US\$50 million), Ethiopia (US\$51.5 million), Sierra Leone (US\$50 million) and Togo (US\$39 million). Outside Africa, FAO has supported successful GAFSP applications by Bangladesh (US\$50 million), Haiti (US\$33 million) and Mongolia (US\$12.5 million).

### **European Union**

The European Union Food Facility (EUFF), an FAO-executed investment programme, is the largest FAO field programme with a single donor. EUFF projects, which involve an investment of €228.6 million (US\$314.6 million), are being implemented in 28 countries in Africa, Asia and Latin America, boosting the agricultural production of 1.8 million vulnerable households. Project activities include input distribution, conservation agriculture, establishment of agricultural business centres, support to national seed systems, livestock production and rural infrastructure development.

## **Promoting sustainable forestry development**

Forests and trees on farms make a major contribution to the food security of millions of poor people, especially those living in and around forests. They provide nutrient-rich supplements to the diets of rural people, including wild leaves, fruits, seeds and nuts, roots and tubers, mushrooms, honey and wild animals and fish. Many forest trees also provide feed for animals, either browsed or collected and fed to livestock in stalls.

Forests also have many indirect benefits for rural people. For example, they regulate water flow; absorb carbon; help to offset the effects of extreme weather events; support bees and other pollinating insects; conserve the gene pool for many



agricultural crops, such as coffee, cocoa, tea, and avocado; and provide an important buffer against storms.

Trees also contribute directly to increased and sustained agricultural production. Agroforestry systems throughout the tropics integrate trees into agricultural systems, helping restore and sustain soils and boost food production. Trees also provide shade for important agricultural crops such as coffee and cocoa and, in upland areas, help stabilize topsoils and prevent loss of critical nutrients.

Food insecurity is directly linked to poverty, and it is usually the very poorest households that are the most dependent on forests. During the lean season and in times of famine, forests provide a life-saving safety net for these families. Forests and trees can make a major contribution to the incomes and therefore to the food security of rural households. Small enterprises based on the processing and sale of non-wood forest products are often run by women, and the income generated from such activities can be an important means of providing food for the family.

Fuelwood is the main energy source for cooking and food processing in most developing countries. About 80 percent of the wood harvested in Africa is used for fuel. Dwindling supplies in many countries are forcing rural households to spend a higher proportion of their limited incomes on fuel, leaving less income for direct expenditure on food. Scarce fuelwood supplies also affect the quantity and quality of the food consumed.

### ■ Climate change, forests and food security

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Forests and trees absorb carbon dioxide from the atmosphere and store it as carbon. Potentially, about one-tenth of global carbon emissions projected for the first half of the 21st century could be absorbed by forests. Forests produce woodfuels that are, in climate terms, a benign alternative to fossil fuels. Reducing the rate of forest degradation or loss, which accounts for about one-sixth of global carbon emissions, could make a significant contribution to climate change mitigation.

However, climate change poses a huge threat to the world's forests and to food security. Increased desertification, drought and floods linked to climate change are degrading or destroying millions of hectares of productive agricultural lands in all regions of the world. Climate change is having direct adverse impacts on the livelihoods and food security of rural people, and these effects are rapidly increasing in some of the world's most vulnerable ecosystems. Many of the poorest of the poor are directly dependent on the forest ecosystems that are the most vulnerable to climate change.

The threat to forest health from insects, disease and wildfire is increasing in many countries. These threats come on top of deforestation and forest degradation resulting from the conversion of forests to other land uses and the overutilization of forest resources. FAO's Global Forest Resources Assessment 2010 found that the world is losing 13 million ha of forest each year to other uses or through natural losses. The International Tropical Timber Organization (ITTO) has found that another 850 million ha of forests are degraded worldwide. Effective action to halt

or reverse global deforestation and to restore degraded forests would have a significant impact on mitigating global climate change.

### **The role of sustainable forest management**

Food security can be enhanced and the risks and negative effects of climate change can be reduced if forests are protected and managed sustainably. Sustainable forest management is a broad concept that encompasses legal, technical, economic, social and environmental aspects of the use and conservation of forests and trees. It implies a number of human interventions, ranging from actions to safeguard and maintain forest ecosystems, to actions to promote the increased production of valuable species for the production of goods and services. The goal is to ensure that goods and services derived from forests and trees meet the needs of today's population, while at the same time securing the continued availability and contribution of forest goods and services to long-term development.

#### **BOX 29**

### **FAO support to Tanzania's forest sector: an integrated approach**

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The United Republic of Tanzania's National Forestry and Beekeeping Programme provides a strategic framework and coordination mechanism for the integration and harmonization of forest and beekeeping activities at local, regional and national levels.

The country's first comprehensive forest inventory, the National Forest Monitoring and Assessment (NAFORMA), is a multisource and multipurpose assessment supported by field measurements, observations and household interviews on the ground and remote sensing data. With FAO's support in design and implementation, NAFORMA will provide key information for the revision of the National Forestry and Beekeeping Programme for the period 2011–2020.

NAFORMA introduces a policy-relevant, holistic and integrated approach that addresses national and subnational information needs as well as international reporting requirements, including REDD+. In addition to information on forest conditions, it will provide a baseline for changes in carbon stock, local people's use and management of forest resources, and forest governance. Analysis of these data will help generate the knowledge to improve policy performance, especially concerning sustainable forest management and the drivers of forest degradation and deforestation.

FAO also provides support in the development and implementation of a national strategy for fire management. It will be integrated with the ongoing forest policy process and implemented at the national and local level, including a monitoring component linked with NAFORMA.

PHOTO 19

Well-managed and healthy forests will be less susceptible to an increased incidence of pests, diseases, fires, storms and drought linked with climate change.



There is widespread agreement on the key principles of sustainable forest management, for example the “Forest Principles” adopted in 1992 at the Rio de Janeiro Earth Summit. However, sustainable forest management is easier said than done. It requires political commitment and financial investments that are difficult to secure, especially in developing countries. Nonetheless, sustainable forest management is critical to food security; without it, the benefits described above will not be delivered to the people who need them.

Sustainable forest management also has a significant role to play in climate change mitigation and adaptation. Sustainably managing forests and trees in areas that are most vulnerable to climate change, such as drylands, mountains and coastal areas, will help reduce the impacts of climate change on ecosystems and on forest-dependent people. Well-managed and healthy forests will be less susceptible to increased incidence of pests, diseases, fires, storms and drought linked with climate change.

### **FAO support to sustainable forest management**

Today, FAO plays a key role in the global effort to promote sustainable forest management. As shown below, it works on three broad fronts: i) forest policies, governance and institutions; ii) forest practices and management; and iii) forest information.

***Policies, governance and institutions.*** FAO has developed policy guidelines to incorporate climate change adaptation and mitigation into national forestry strategies, as well as practical guidelines for use by forest managers. Through the National Forest Programme Facility, FAO works directly with 70 developing countries to develop and implement improved forest policies and programmes using participatory approaches.

FAO has developed guidelines for improved forest governance, which is key for reducing deforestation and forest degradation. In collaboration with the EU and other partners, FAO is strengthening the capability of stakeholder groups to develop and implement effective action to strengthen forest governance and trade, directly

addressing illegal logging, corruption, and the resulting distortions in the market for forest products.

At the community level, FAO works directly with the rural poor and with local communities to develop small- and medium-size forest-based enterprises. The result is to improve the livelihoods and increase the incomes of the rural poor, directly contributing to food security.

The potential of forests to contribute to food security can only be achieved if local people have secure tenure of land and forest resources. FAO has developed guidelines for forest tenure reform aiming to improve access of local people to forest resources and a more equitable distribution of benefits from forests.

Limited availability of land often leads to land-use competition between forestry and agriculture. FAO is promoting the practice of agroforestry, where trees and agricultural crops are cultivated on the same piece of land. The trees produce food or fodder and many of them fix nitrogen, thus helping to improve the soil.

***Good forest practices.*** FAO has developed guidelines for improved forest practices, including voluntary guidelines for planted forests, for improved harvesting practices and for addressing the problem of forest fires as well as pests and diseases. National and local capacities are being strengthened to implement these guidelines.

FAO works directly with countries and communities to promote investment in improved forest management, including tangible investments in planted forests and reforestation. The result is increased income as well as enhancement of forest carbon stocks and sequestration capacity through improved forest management practices.

Significant new levels of funding are becoming available to developing countries to help mitigate climate change by sustainable forest management through Reducing Emissions from Deforestation and Forest Degradation (REDD+) programmes. These programmes give a financial value to carbon stored in forests and provide incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. It goes beyond a focus on deforestation and includes conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks. Jointly with UNDP and UNEP, FAO implements the UN-REDD Programme, a collaborative initiative to assist developing countries in preparing and implementing national REDD+ strategies and developing associated forest monitoring systems. FAO is helping countries to build their own capacities to implement sustainable forest management, in part by emphasizing that new funding reaches local levels where key decisions about forests are made on a day-to-day basis.

***Information.*** Effective forest policies and practices are based on good information. In this era of information overload, the challenge for FAO is to monitor, assess and analyse huge amounts of data in order to focus on the most important information that can be translated into useful knowledge for national and local decision-makers.

At the global level, FAO's *Global Forest Resources Assessments* and *State of the World's Forests* provide a solid foundation for national and international decision-making. These assessments have been expanded from information about forest resources to include socio-economic and institutional aspects. At the national and local levels, FAO works directly with the users of information to build their capacities to monitor and assess their own forests, and to focus on the most critical information that will be the basis for implementing sustainable forest management.

One of the most important roles of FAO is bringing together representatives from member countries to identify the most critical issues of the day and to develop strategies and approaches for addressing these issues. FAO's Committee on Forestry, which meets biennially, and its six Regional Forestry Commissions provide an opportunity for the heads of national forestry agencies to develop policies and encourage practices for achieving the sustainable management of the world's forests. In addition, FAO organizes a World Forestry Congress every six years, bringing together senior representatives from government, the private sector, academia and NGOs to consider approaches to the major forest issues of the time.

### **FAO's focus in the future**

As FAO continues to play a pivotal role in efforts to implement sustainable forest management in all countries, in the future, its focus will remain on forest policies, practices and information, and its work will be results-based. This means building on its most successful initiatives to ensure that good ideas are translated into positive outcomes.

Climate change, and especially REDD+, have brought forests to the centre of international attention. FAO can play a key role in helping countries capitalize on new sources of funding to help combat deforestation and forest degradation. Addressing critical issues such as forest governance, land-use planning and forest tenure will become increasingly important in ensuring the success of REDD+, and FAO will increase its support to countries in these areas.

It is equally important to highlight the adaptive role of forests in the context of climate change and food security. Wise watershed management helps mitigate the effects of increased floods and drought. Forests play an important role in the livelihood strategies of poor people affected by climate change. FAO will increase its efforts to strengthen community-based organizations to ensure a positive impact of REDD+ schemes on the livelihoods of local people and to safeguard against potential negative impacts.

Food security, forestry and climate change cannot be treated separately. To be effective, policies to promote food security must be integrated with policies to address climate change and policies to promote sustainable forest management. Forests must be included in poverty reduction strategies, and in climate change strategies. To increase its impact, FAO must improve its own ability to integrate the advice it provides to countries across disciplines.

In the area of forest information, FAO is pioneering efforts to involve every country in a global assessment of forest cover (used to monitor deforestation rates)

by training people in the countries to analyse their own resources. This initiative will require increased attention and investments in the future.

To sum up, FAO will continue to work with all member countries to improve the management of their forests. Sustainable forest management must be a critical component of each country's overall development strategy if food security is to be achieved. Sustainable forest management has the capacity to help mitigate the most severe effects of climate change and to reduce the potentially devastating impacts of climate change on food security and agricultural production.

## The role of fish and fisheries in food security and nutrition

The fisheries and aquaculture sector is crucial to food security, poverty alleviation and general well-being, and its importance is growing. People have never consumed so much fish or depended so much on the sector for their livelihoods as they do today.

Fisheries and aquaculture provide an excellent source of affordable, high-quality animal protein and micronutrients that are particularly important for pregnant women and young children. In 2008, the contribution of fish to global diets reached an all-time high of about 17 kg per person on average, supplying more than 3 billion people with at least 15 percent of their average animal protein intake.

Employment in fisheries and aquaculture has grown faster than the world's population and employment in traditional agriculture. In 2008, almost 45 million people were directly engaged in the sector. Added to these are important secondary sectors such as handling and processing, where women represent half of those involved. Altogether, including the family dependants of these workers, fisheries and aquaculture support the livelihoods of some 540 million people, or 8 percent of the world's population.

The sector also has increased its importance in the global market. Fish and fishery products continue to be the most-traded of food commodities, worth a record US\$102 billion in 2008, yet seafood is often overlooked as a component of global food security (Smith *et al.*, 2010).

### ■ Consumption and supply

Since 1961, fish consumption has increased most substantially in East Asia, Southeast Asia and North Africa. As of 2007, consumption was lowest in Africa, while Asia accounted for two-thirds of total consumption. However, the increase has not been uniform across and within countries and regions, reflecting the different levels of availability of fish and other foods, including the accessibility of aquatic resources, as well as diverse food traditions, tastes, demand, income levels, prices and seasons. In many countries, fish contributes more than or close to 50 percent of total animal protein intake (Figure 26).

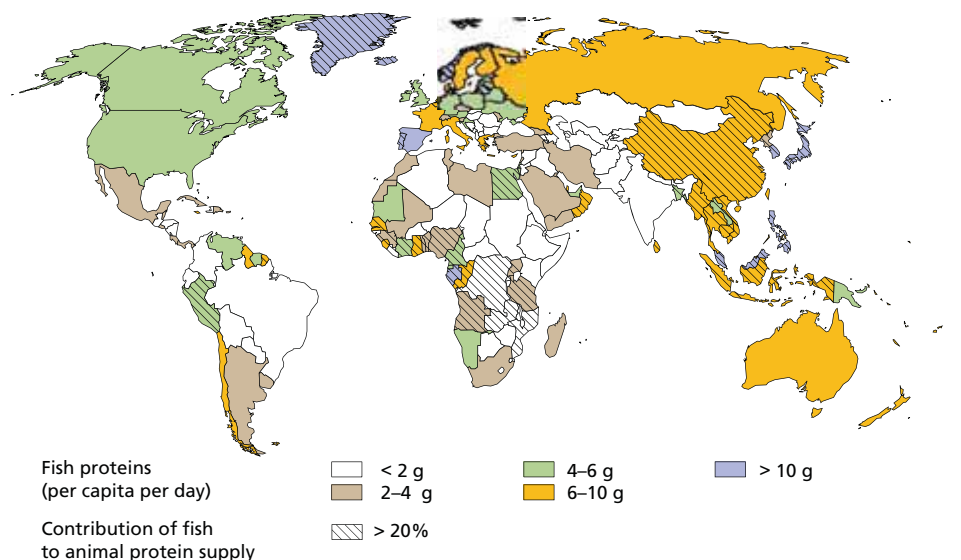
In the last decade, the surging demand for fish and fishery products has increasingly been met by the growing production of aquaculture, which now accounts for almost half of total food fish supply and is set to overtake capture fisheries as a source of food fish (FAO, 2010e). In 2008, capture fisheries and aquaculture supplied the world with about 142 million tonnes of fish, of which 115 million tonnes were used as human food. Global capture fisheries produced about 90 million tonnes, valued at US\$94 billion, of which some 80 million tonnes were from marine waters and a record 10 million tonnes from inland waters.

Aquaculture fish production in 2008 reached 52.5 million tonnes, valued at US\$98.4 billion. World aquaculture is heavily dominated by Asia, in particular by China, which account, respectively, for 90 percent and 62 percent of global production in quantity terms.

Fish consumption levels are affected by deterioration of fish product quality and significant post-harvest losses, which equals 10 percent by weight of world fish catch (Akande and Diei-Ouadi, 2010), due to poor handling, transportation, processing, storage and distribution. In addition to physical losses of fish, the economic losses resulting from a lower quality and value of the end-product are often significant. FAO promotes technology and knowledge that could help the fisheries industry, including the post-harvest sector, reduce waste and increase the amount of fish ending up as food. Improvements in post-harvest handling as well as in

FIGURE 26

## Contribution of fish to animal protein supply (average 2005–2007)



Source: FAO, 2010e.



marketing have led to significant efficiency gains, lower costs, wider choice and safer and improved products (FAO, 2010e; 2009j).

## ■ Nutrition security

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Fish from both culture and capture fisheries can make significant contributions to improving and diversifying dietary intake and promoting general nutritional well-being. Fatty fish, in particular, are an extremely rich source of essential fatty acids that are crucial for normal growth and mental development, especially during pregnancy and early childhood (FAO, 2003b). Fish are also rich in vitamins and minerals and therefore can provide an important source of nutrients, particularly for those whose diets lack other animal source foods.

Fish and fisheries products are also among the best sources of essential micronutrients. Micronutrient deficiencies affect hundreds of millions of people, particularly women and children, in the developing world. Many rural diets lack diversity, making it vital to have access to foods that provide the essential nutrients.

In coastal populations, fisheries products often are the major source of animal protein, essential fatty acids and needed micronutrients. Although the cost of fish can be high for some species, there are others with very high nutritional value that can be affordable to low-income populations.

## Capture fisheries

The maximum potential from the world's oceans in terms of production from wild living marine resources has probably been reached, necessitating more closely controlled approaches to fisheries management to ensure that current supplies are maintained. The estimated proportion of underexploited or moderately exploited marine fish stocks declined to 15 percent in 2008, whereas the proportion of overexploited, depleted or recovering stocks increased to 33 percent. Both these trends give cause for concern. The proportion of fully exploited stocks has remained relatively stable at about 50 percent (FAO, 2010e).

Fisheries management poses challenges for all countries. In some, improvements in resource management are proceeding hand-in-hand with public-sector reform and measures to promote better governance. However, there has been only limited progress in the implementation of effective management measures in most of the world. Key issues include the lack of progress in reducing fishing capacity and related harmful subsidies (FAO, 2009j), and the high levels of unwanted and often unreported bycatch and discards in many fisheries. Global discards amount to about 7 million tonnes per year (FAO, 2010e). FAO, regional fishery bodies, national fisheries administrations and concerned fishery stakeholders continue efforts towards promoting implementation of the Code of Conduct for Responsible Fisheries, and associated international action plans, strategies and guidelines, including the ecosystem approach to fisheries (FAO, 2010k).



TABLE 7

## World capture fisheries and aquaculture production and consumption

PRODUCTION	2008	2009 (estimate)	2010 (forecast)
	Million tonnes		
<b>Total production</b>	<b>142.3</b>	<b>145.1</b>	<b>147.0</b>
Capture fisheries	89.7	90.0	89.8
<b>Utilization</b>	Million tonnes		
<b>Total</b>	<b>142.3</b>	<b>145.1</b>	<b>147.0</b>
Food	115.1	117.8	119.5
Feed	20.2	20.1	20.1
Other uses	7.0	7.2	7.4
<b>Aquaculture's contribution</b>	Percentage		
To total production	<b>36.9</b>	<b>37.9</b>	<b>38.9</b>
To food fish	45.6	46.8	47.9
CONSUMPTION	kg/year		
Per caput food fish consumption	17.1	17.2	17.3
From capture fisheries	9.3	9.2	9.0
From aquaculture	7.8	8.1	8.3

Source: FAO, 2010e and 2010k.

### Inland fisheries

Inland fisheries support 61 million people worldwide. A vital component in the livelihoods of people in many countries, they contribute very significantly to poverty alleviation and food security in many small communities (FAO, 2010e). However, irresponsible fishing practices, habitat loss and degradation, water abstraction, drainage of wetlands, dam construction and pollution have caused substantial declines in inland fishery resources.

The role of inland fisheries in poverty alleviation and food security needs to be better reflected in fisheries policies and in strategies for rural development and particularly in programmes concerning the use of freshwater. The tendency to undervalue inland fisheries has resulted in inadequate representation in national and international agendas.

### Small-scale fisheries

Small-scale fisheries contribute more than half of the world's marine and inland fish catch, almost all of which is destined for direct human consumption (FAO, 2010e; 2009j). Such fisheries employ more than 90 percent of the world's capture fishers and support another 84 million people employed in associated jobs (FAO, 2009k). Millions of other rural dwellers, particularly in Asia and Africa, are involved in seasonal or occasional fishing activities with few alternative sources of income and employment. Almost half of the people employed in small-scale fisheries' primary and secondary sectors are women and more than 95 percent of those involved live in developing countries.

Small-scale fishing communities are often poor, vulnerable and marginalized, yet they contribute significantly to local economies and the potential for growth is enormous. Where fish is produced and processed locally, the net income benefit to the community is more than twice the value of the fish sales. Increasing the role of small-scale fisheries as contributors to poverty alleviation and food security should be a priority, yet government policy agendas tend to give little weight to such issues.

### **Aquaculture: trends, prospects and challenges**

Between 1970 and 2008, the production of food fish from aquaculture increased at an average annual growth rate of 8.3 percent (or 6.5 percent excluding China). Aquaculture is perceived as having the greatest potential to produce more fish to meet the growing demand for safe and high quality aquatic food (FAO, 2011f). By 2012, more than 50 percent of global food fish consumption will probably originate from aquaculture.

Aquaculture has not grown evenly around the world. There are marked intra-regional and interregional and country variations in a number of areas, such as production level, species composition, farming systems and producer profile. Asia accounts for almost 90 percent, while China contributes two-thirds of global aquaculture production. In China, 80 percent of food fish consumed is farmed, while 27 percent of total fish consumption in the rest of the world is supplied by aquaculture.

Aquaculture has pushed the demand for, and consumption of, species that have shifted from being primarily wild-caught to being primarily farmed, with a decrease in their prices and a strong increase in their commercialization. These include shrimps, salmon and bivalves, as well as tilapia and pangasius.

Aquaculture makes valuable contributions to local, national and regional economies through goods and services sold on domestic and export markets. While its contribution to GDP is often small, its importance to the national economy in terms of poverty alleviation and nutritional benefits can be significant. Generally, subsistence and small-scale aquaculture contribute directly to poverty alleviation and food security. Small- and large-scale commercial aquaculture, with species such as shrimp, salmon, tilapia, catfish, grouper, seabass and seabream, flatfishes, mullet and carp, can enhance production for domestic and export markets, and generate employment opportunities in production, processing and marketing sectors. Indirectly, tax revenues from commercial aquaculture enterprises and foreign exchange export earnings allow governments to invest in sectors that contribute to food security.

Numerous countries have formulated or are in the process of formulating policies, strategies, plans and legislation that facilitate growth and efficient management of the aquaculture sector. Many countries are strengthening their aquaculture legislation to address competition for scarce land and water resources from other economic development activities, such as agriculture and tourism, through zoning, licensing, environmental assessment, and management and control measures.

**BOX 31****Aquaculture development: key factors for future success**

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According to an FAO analysis of the future of global aquaculture, the following factors determine the supply of aquaculture products:

- access to land and water resources, and intensification;
- access to adequate feed (and their substitutes): fishmeal, fish oil and trash fish;
- greater capitalization and diversification of production systems and species;
- access to capital;
- environmental management, biosecurity, conservation of genetic resources and climate change adaptation;
- rising energy cost;
- human resources development;
- research and development;
- information and communication technologies and networking;
- access to markets;
- sound policies and governance;
- government support.

Many, if not all, apply in regions where aquaculture has generally not yet developed major capacities of fish production, including Africa, Latin America, Central Asia, South Pacific and Eastern Europe. Even in Asia, Western Europe and North America significant challenges to development, expansion and consolidation of the aquaculture industry remain.

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*Source:* Based on FAO (2007c) and Hishamunda, Poulain and Ridler (2009).

**Research and development**

Major research and development achievements include the genetic improvement of the farmed tilapia strain of Nile tilapia, closing the life cycle and hatchery production of white legged shrimp larvae, and closing the life cycle of southern bluefin tuna. New technologies include developing cages and nets that can be used in open seas and larger inland waters, and upscaling recirculation systems. Future gains may also come from larger-scale production technologies, the culture of a wider range of species, and use of biotechnologies allowing for temperature and salinity tolerance, disease resistance and cheaper feed substrates (Godfray *et al.*, 2010). To address the issue of the sustainability of using fishmeal and fish oil in aquafeeds, global research efforts seek affordable and high-quality plant- and animal-based feed ingredients, to reduce dependence on wild fish resources. Any

development in aquaculture should be made with a view to diminishing reliance on wild stocks.

With increasing demand, there is growing recognition of the need to address consumer concerns for quality and safe aquaculture products, environmental integrity, animal health and welfare, as well as social considerations. Food safety, traceability, certification and ecolabelling are becoming increasingly important for the sector.

In 2003, FAO presented the CFS with a framework for increasing the contribution of aquaculture for food security, poverty alleviation and nutrition (FAO, 2003b), covering the following strategic elements:

- integration of aquaculture into national development;
- stakeholder participation in decision-making in aquaculture;
- strategic planning, appropriate policies and good legal and institutional frameworks;
- information, awareness raising and capacity development;
- public-private sector partnership and regional cooperation.

### ■ Fisheries sector requires good management and good governance

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Widespread recognition of the benefits of fish consumption could lead to additional demand. While massive demand for fish and fishery products might reduce their affordability, supply might also be enhanced to some extent through:

- reducing post-harvest losses, quality assurance and more efficient marketing;
- improving resource management, fishing operations, fishery enhancements and culture-based fisheries;
- protecting fishery resources from adverse impacts by other activities;
- promoting utilization of anchoveta and other nutritious low-value fish for human consumption;
- providing due recognition of, and support to, small-scale fisheries and inland fisheries.

Aquaculture production is likely to continue expanding, though at a lower rate, in part thanks to research and technological advances. Expansion in aquaculture production will put a downward pressure on prices, thereby increasing access to fish and fishery products. For aquaculture to be able to play this role, policymakers and the industry will have to tackle some of the likely impediments to the sector's development, including more stringent requirements for environmental protection and higher food safety standards, shortage of feed and increasing energy prices.

The global aquaculture sector's long-term success will depend on commitments by governments to support a good governance framework for the sector. It will also depend on improved public recognition of its contribution to food security and poverty alleviation. As the sector further expands, intensifies and diversifies, it should address environmental and social concerns in a transparent manner, backed

with scientific evidence. The sector should also prepare for potential impacts of climate change and global economic crisis, and further assist small-scale producers. It is after addressing these issues that aquaculture's contribution to food security and nutrition will be enhanced.

## Preparing for and responding to threats and emergencies

People around the world are increasingly exposed to disasters, and the impact of these crises tends to be most severe on those who depend on agriculture. FAO helps protect and rebuild agricultural livelihoods with the aim of restoring local food production, bolstering self-reliance and strengthening community resilience. Finding ways to develop the capacity of vulnerable populations to prepare for and respond to threats and emergencies is one of the guiding principles of FAO's approach to reducing and managing risk in food and agriculture.

Crises and disasters of all types have devastating impacts. However, they can also create opportunities to build back more soundly, for example by creating more robust structures and institutions to reduce and manage risk, and introducing more sustainable agricultural and natural resource management practices to improve food security and nutrition and strengthen community resilience.

Globally, the number of recorded disasters has doubled from approximately 200 to nearly 400 per year over the past 20 years, with 76 percent of all disasters climate-induced, and nearly half the loss of human life and some 80 percent of economic loss due to natural disasters (IASC-UNISDR, 2010). Mega-disasters, such as the 2002 drought in India, Indian Ocean tsunami in 2004, Cyclone Nargis in Myanmar in 2008, Haiti earthquake and Pakistan floods in 2010, resulted in very significant loss of life and livelihoods.

Sudden-onset natural disasters, such as earthquakes, floods and storms, lead to great loss of life, destroy countless livelihoods and leave millions of people devastated every year (IASC-UNISDR, 2010). These large-scale natural disasters have immediate and ongoing impact on lives and livelihoods and tend to shape humanitarian assistance in food security. Yet, slow-onset natural disasters must not be forgotten, such as droughts; complex emergencies or protracted crises linked to conflict, weak institutions and lack of governance; outbreaks of transboundary animal and plant pests and diseases; food chain crises; and economic and social emergencies, such as HIV/AIDS or soaring food prices (FAO, 2010a).

Complex emergencies, either post-conflict or resulting from other socio-economic crises, continue to affect tens of millions of people globally every year. Furthermore, recent increases in the number of outbreaks of transboundary animal diseases, explained in detail in the section below, have underlined the need to address such threats in a comprehensive approach, oriented to the entire food chain. Changing agro-ecological conditions, intensifying food production systems and expanding global trade increase the likelihood that animal and plant diseases and pests will

emerge and spread farther and faster than ever before, and of unsafe food reaching numerous consumers in distant markets.

## ■ Disaster risk management

Given the increasing frequency and intensity of disasters and their impact on agriculture-dependent populations, a comprehensive and integrated approach based on disaster risk management (DRM) is essential to enhance people's resilience before, during and after crises. For FAO, the three pillars of the DRM are disaster risk reduction (preparedness, prevention and mitigation); emergency response and rehabilitation; and transition to development. A significant proportion of FAO rapid response is related to crises of transboundary animal diseases, such as avian influenza or foot-and-mouth disease, as well as prevention and mitigation (early warning/early action) related to transboundary plant pests and diseases, such as locusts, wheat rust and cassava diseases.

The systematic adoption of a DRM approach in food and agriculture helps people develop the capacity to prepare for the potential impact of crises in food security and nutrition, and prevent and mitigate the effects of transboundary animal and plant pests and diseases. FAO has continued to develop an integrated approach to DRM aimed at reducing the vulnerability of people before, during and after disasters. DRM helps ensure that disaster-affected populations recover swiftly from the initial damage and disruption of the crisis and that affected people are once again able to benefit from interventions focused on sustainable development.

Emergency preparedness, response and rehabilitation in food and agriculture must address very specific needs of smallholders, pastoralists, fishers and fish farmers, forest users, landless farm workers and their dependants, with particular focus on food insecure and nutritionally vulnerable groups.

Longer-term measures for preventing and mitigating the adverse impacts of crises and disasters on the most vulnerable people and places need to be promoted and sustained. This includes improving institutional capacities and agricultural



**PHOTO 20**

For FAO, the three pillars of disaster risk management are disaster risk reduction (preparedness, prevention and mitigation); emergency response and rehabilitation; and transition to development.

technologies and collaborating with UN agencies and other partners, regional organizations, national counterparts and other sectors (such as health, education, environment, social affairs) to ensure integrated support at global, regional, national and local levels. Such support needs to increase the resilience of communities and people and develop their capacity to prepare for and respond to disasters in food and agriculture.

### **Disaster risk reduction**

Disaster risk reduction (DRR) is the concept and practice of reducing disaster risks through systematic efforts to analyse and manage factors that cause disasters through, for example, reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and environment, and improved preparedness for adverse events. DRR is an integral component of disaster risk management. Hazards, or the degree of exposure to potentially damaging events, vulnerability, or the susceptibility of populations to external shocks, and inadequate capacity of populations to withstand shocks are the main elements that result in risk. Natural hazards do not automatically lead to disaster. Rather, disaster often results from the combination of hazard exposure, overpopulation, and vulnerable and poorly prepared communities. Human activity, leading to degraded lands and soils, changes in land use, poor natural resource and environmental management and unplanned settlements, often exacerbates risk levels.

A variety of concepts and tools, used by FAO and its partners, analyse causal factors in the context of food security and livelihoods. Effective responses that link short- and long-term needs depend on baseline information developed through situation analysis and forecasting that identifies the severity, causes, and magnitude of food and nutrition insecurity for key livelihood groups, households and individuals. Emergencies in food and agriculture can often increase existing vulnerabilities and exacerbate gender differences, particularly in societies characterized by significant gender inequality. Gender and age are thus critical factors in determining levels of vulnerability and resilience to crisis, and effective preparedness and response needs to identify ways to bridge gender and age gaps.

### **Sustainability and resilience**

Strategies that link short-term responses with long-term goals of sustainability and resilience are essential if vulnerable countries are to avoid large-scale loss of life, destruction of the environment, infrastructure and economic activity, and degradation of livelihoods and nutrition. FAO provides proactive support such as livelihoods-based risk, vulnerability and food security assessments, support for better preparedness (such as enhanced early warning, crop forecasting and climate forecasting for agricultural producers at local level), sector-specific emergency response and rehabilitation, promotion of good agricultural practices for disaster risk reduction, and better integration of risk reduction strategies and coordination between local, sectoral and national institutions. The shift between all of the phases



of this support should be considered dynamic and fluid, and based on interventions focused on saving and sustaining livelihoods (Baas *et al.*, 2008).

For FAO and its partners, attempts to link short- and long-term perspectives in protracted, complex and socio-economic crises cut across multiple dimensions that include programming, situation and response analysis tools and processes, humanitarian and development coordination, and aid architecture. Beyond the challenges of immediate life-saving measures, technical solutions need to be selected and applied based not only on the type of crisis, but also the potential for medium-term recovery and a longer-term vision of sustainability. For example, after acute, sudden-onset disasters, seed provision to affected farmers can help vulnerable households resume agricultural production for the next season and rebuild livelihoods. However, in the context of chronic slow-onset disasters, such as drought in some parts of Africa, the repeated provision of seed will not necessarily solve seed and food insecurity. FAO support in the establishment of functioning national seed systems has proven successful in chronically seed insecure situations. Taking a longer-term approach, however, may not always be possible due to often short-term operational approaches to response and humanitarian funding availability that may constrain more sustainable approaches to restoring production in protracted crises and other types of disasters.

### Food price volatility

Lessons learned from the soaring food price crisis in 2007–2008 revealed that certain groups of people were particularly vulnerable to food price volatility, including hundreds of millions of small-scale food producers, millions of daily wage agricultural workers, people living in poverty in urban areas, and people living in countries in protracted crisis or experiencing complex emergencies (UN, 2010d). As the complexity of analysing the causal factors of food insecurity increases, in terms of emergency response to volatile food prices within globalized and integrated food systems, there is a real need to focus across disciplines and identify ways to reduce and manage the risk of surging food prices and fluctuating food supply to vulnerable populations.



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**PHOTO 21**

People living in poverty in urban areas are particularly vulnerable to food price volatility.



## Climate change

The agriculture sector is particularly sensitive to the consequences of climate variability and change, and communities that rely on agriculture are increasingly vulnerable. Climate variability and change add to the complexity of analysing causes of food and nutrition insecurity, exacerbate disaster risk, and increase vulnerability to existing hazards. The Inter-Agency Standing Committee Informal Task Force on Climate Change has concluded that extreme climate variability and associated consequences are likely to become the norm, rather than the exception, in terms of future emergency response, and more sharply outline the need for addressing vulnerability to natural disasters and climate change impacts at several different levels given the complex interaction of many cross-cutting issues.

Nearly 634 million people live in at-risk coastal areas a few metres above existing sea levels, three-quarters of which are located in the Asian flood-prone river deltas or in low-lying small island states. Almost two-thirds of mega-cities with populations above 5 million are located, at least partially, in low-lying flood-prone areas, and slightly more than 20 percent of the urban population in the least-developed countries live in highly vulnerable environments, prone to floods and other disasters (UN, 2008).

The implications of climate change are significant in terms of crises and threats in food and agriculture, including more frequent and intense storms, coupled with rising sea levels and increased risk of floods. The impacts of increasingly frequent and severe hydro-meteorological disasters can be avoided or minimized if proper mitigation measures are implemented. Establishing early warning systems to alert communities with regard to potential cyclones, tsunamis or similar hazards are important actions for saving lives and limiting fatalities and damage in coastal areas, and may protect the lives and livelihoods of fishing communities and other coastal populations. However, in worst-case scenarios, some low-lying areas may no longer be viable for human habitation.

**Early warning.** Early warning systems for drought can alleviate the dramatic consequences on livestock assets and herder livelihoods in pastoralist areas. Providing weather and climate information to farmers on a regular basis, through radio or mobile phone technology, can address the need for proactive adaptation of farming practice to manage climate risk. Early warning systems may exist in many countries, but decreasing risks and multiple hazard exposure of vulnerable populations often goes beyond what they provide.

For agriculture, reducing exposure means finding ways to ensure that farmers have access to seed varieties that are better adapted to recurrent natural disasters and the new prevailing climatic conditions, such as varieties with enhanced drought resistance, earlier maturity, resistance to waterlogging or resistance to emerging pests and diseases. Farmers also need support in adapting agricultural practices, for example, the use of conservation agriculture, which would help reduce vulnerability to climate variability and change.

Many of the vulnerable people in countries currently challenged by humanitarian crises will most likely face even greater risk due to the expected impacts of climate variability and change that heightens the productive risks faced by people dependent on farming, fishing and fish farming, livestock-raising or forests, particularly in fragile environments. DRR and its focus on building resilience to existing climate variability is a useful entry point for climate change adaptation, and proactive strategies to reduce risk are a first line of defence against the potential impacts of changing and variable climate.

### ■ Government response

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Reducing vulnerability to crises and disasters requires a major response by governments and relevant stakeholders throughout complex food and agricultural systems. Heightened global focus on the development of national DRR platforms has grown since 2005, with the launch of the Hyogo Framework for Action international strategy for disaster reduction.

Many of the defining characteristics of complex or protracted crises, such as conflict, chronic food insecurity, poor agricultural performance and absence of effective institutions are also considered within other international frameworks that address peace-building, conflict early warning or governance (UNISDR, 2007). Moreover, many countries in a protracted crisis are also vulnerable to two or more natural hazards, so finding ways to incorporate political and economic risk while reducing the risk of recurrent natural disasters must be considered (Dilley *et al.*, 2005).

At the country level, the governments of countries experiencing crisis situations will need to play new and stronger roles in risk reduction and the coordination of external assistance through capacity development of national and local disaster management institutions. National capacity to provide emergency relief when local coping capacities have been exceeded needs to be strengthened for all types of crises in food and agriculture. Response capacity needs to be developed and supported by focusing on ways to protect livelihoods, provide inputs to restore agricultural production, control plant and animal pests and diseases, and assess environmental and agricultural damage and hazard exposure.

### ■ Disaster preparedness critical to development

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FAO support to country-level preparedness, emergency response and rehabilitation will necessarily be influenced by changing financial, institutional and market conditions. Partnerships are evolving and deepening to address the need to better link short- and long-term programming objectives. Funding modalities will continue to evolve to be more diversified and pooled at global and country levels, and ongoing humanitarian reform within the United Nations system will offer opportunities for FAO with regard to coordination and leadership on food security and

nutrition issues at global, regional, national and local levels. The reactive nature of humanitarian response needs to be replaced by an integrated approach based on DRR that incorporates political and security hazards currently missing from the risk reduction discourse, and takes a more proactive approach to livelihoods (Maxwell, 2010).

Ensuring a deeper understanding of the constraints related to enhancing resilience, understanding vulnerability and diversifying livelihoods is necessary, particularly through greater understanding of local concepts of hazards and community-based risk reduction measures. A key challenge is to understand the linkages between increasingly complex food and agricultural systems, deepening vulnerabilities across a wider range of populations, and multiple and growing hazard exposure that signals the need for increased focus on more integrated ways to reduce and manage the risk of disasters. For many stakeholders at all levels, the DRM approach lessens the need for emergency relief, reduces food and nutrition insecurity, and enhances the sustainability and impact of FAO efforts to strengthen the capacity of countries and partners to prepare for and respond to threats and emergencies in food and agriculture.

## **Fighting transboundary plant, animal and fish diseases**

Plant pests and diseases of animals have threatened societies since farming began and, in severe cases, have resulted in famines and migration. Natural resource managers and users themselves are at the forefront in combating pests and diseases, but given the propensity of diseases to spread, the presence of a pest or disease in one area poses a threat to adjacent areas and, in today's globalized world, even to very distant localities. Sudden and unexpected outbreaks of transboundary pests and diseases can thus imply negative impacts for third parties, calling for additional response through collective action from affected parties or a national or international public agency.

More than a dozen transboundary plant pests and diseases may cost over a billion US dollars in losses and control operations annually. Outbreaks of forest insect pests damage nearly 35 million ha of forest annually, threatening their ability to provide economic, environmental and social benefits (FAO, 2009l, 2010d). Diseases of livestock reduce production by close to 20 percent, while individual epidemics can cause losses of several billion US dollars (FAO, 2009c). Estimated losses due to transboundary aquatic animal diseases in aquaculture range from several hundred million US dollars caused by a single infection to several billion from mixed infections, in some cases leading to the total collapse of the sector (Bondad-Reantaso *et al.*, 2005).

Pests and animal diseases pose the greatest immediate threat when they occur irregularly, are introduced after long absences, or enter for the first time into ecologically favourable conditions where there are few natural factors to limit their

## BOX 32

**Recent spread of selected transboundary pests and diseases**

- *The Desert Locust* is probably the best-known example of a migratory plant pest because of the speed at which outbreaks occur and the scale infestations can reach. Locust swarms may spread over millions of square kilometres. In 2003–2005 swarms severely affected most countries of North and northwest Africa.
- *Wheat stem rust* became a new cross-border threat of a global dimension in 1999 when a novel strain (Ug99) emerged in East Africa and reached the Islamic Republic of Iran in 2007. The regions of East Africa, the Near East and Central and South Asia at immediate risk account for 37 percent of global wheat production. This new rust strain is highly virulent to almost all wheat varieties and could cause devastating crop losses if its spread is not prevented.
- *Stripe (yellow) rust* threatens the same regions as Ug99. Major epidemics of new, highly aggressive strains of stripe rust have occurred in Ethiopia, Iraq, Morocco, the Syrian Arab Republic, Turkey and Uzbekistan. An estimated 15 million ha are considered susceptible in the wheat regions of North Africa and South Asia.
- *Highly pathogenic avian influenza* H5N1 emerged in China in 1996, spread to Southeast Asia in late 2003 and, from there, westwards, reaching Europe and Africa in 2005. The virus causes severe and often fatal disease in humans although, to date, the virus does not readily transmit between humans.
- *African swine fever* outbreaks were reported in the Caucasus region in 2007–2008 for the first time ever. If not contained, it is likely to spread north, threatening pig production in the Ukraine and Russian Federation.
- *Rift Valley fever (RVF)*, historically confined to Africa, occurred in southwest Saudi Arabia and northwest Yemen in 2000, its first occurrence outside the African continent and Madagascar.
- *Foot-and-mouth disease* virus of Asian origin was introduced into the United Kingdom in 2000, causing direct and indirect economic losses totalling more than US\$10 billion.
- *Epizootic ulcerative syndrome*, whose original distribution was only in Asia and the USA, expanded its geographic range to the Chobe-Zambezi river system in Africa in 2006, mainly affecting wild fish and some cultured populations.
- *Infectious salmon anaemia* has severely affected the salmon aquaculture sector, particularly in Chile since 2007, causing millions of dollars of losses to the industry and seriously impacting on the livelihoods of people dependent on the sector.

- *White spot disease*, one of the most serious diseases of cultivated shrimp, has affected more than 20 shrimp producing countries over the past two decades.
- *The mountain pine beetle*, or *Dendroctonus ponderosae*, native to North America, has devastated more than 11 million ha of native pine forest in Canada and western United States since the late 1990s and is spreading well beyond its normal range of occurrence, an unprecedented outbreak exacerbated by milder winter temperatures.
- *The cypress aphid*, or *Cinara cupressivora*, native to Europe and Near East, spread throughout East and southern Africa during the 1990s, causing an initial loss of US\$44 billion and US\$4.6 million per year through reduction in annual growth increment. It has now spread to countries in South America.

spread, and people do not have experience in managing them. Such occurrences often have the most evident social and economic impact and, in many cases, affect poor and marginalized people most severely. The emergence and spread of diseases, pests and invasive species has increased dramatically in recent years as a result of trade liberalization, increases in movements of goods and people, vastly reduced travel times, extreme weather events and climate change that causes ecological changes. These developments have heightened the need for international cooperation in controlling and managing the risks posed by transboundary pests and diseases.

### ■ **FAO turns commitments into practical action**

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FAO helps translate international commitments into national actions through preparation and support to implementation of international phytosanitary standards, guidelines and codes of conduct (e.g. FAO, 2000b; 2005; 2006; 2011g).

Concerned about the immense losses in agricultural production and associated social and economic impacts, FAO established the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) in mid-1994, with particular emphasis on the Desert Locust and rinderpest, although also to threats posed by other pests and diseases.

EMPRES makes a significant contribution to the containment of transboundary animal and plant pests and diseases by initiating and coordinating international control programmes; tracking the spread of pests and diseases to facilitate early reaction; supporting the establishment of local, national, and regional capacities for pest and disease control through technical and development assistance; mounting emergency responses; and engaging in international zoosanitary and phytosanitary standard setting to reduce the risk of spread of pests and diseases.



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PHOTO 22

The emergence and spread of diseases, pests and invasive species in recent years has heightened the need for international cooperation in controlling and managing such risks.

### Coordinating international control programmes

The following examples of FAO activities in the area of transboundary animal and plant pest and disease risk management indicate the importance of a proactive preventative approach.

***Desert Locust.*** EMPRES Desert Locust Component was designed to allow Desert Locust-affected countries, regional organizations, donors and FAO to collaborate in the development of improved risk management and control strategies. The programme was first launched in the EMPRES Central Region (covering Djibouti, Egypt, Eritrea, Ethiopia, Oman, Saudi Arabia, Somalia, the Sudan and Yemen) because most previous Desert Locust plagues originated in the area around the Red Sea, but was then extended to the EMPRES Western Region (Algeria, Chad, the Libyan Arab Jamahiriya, Mali, Mauritania, Morocco, the Niger, Senegal and Tunisia) in 1997.

The immediate advantages of EMPRES became obvious during the Desert Locust crisis in 2003–2005, which started simultaneously across the Sahel in Mauritania, Mali, the Niger and the Sudan as a result of extraordinary heavy rains in summer 2003. Through development and investment in early warning, national locust surveillance and reporting systems, human capacity development, contingency planning and timely reaction mechanisms, the outbreak in the Central Region was brought under control in May 2004. New locust swarms that arrived in the Central Region from the Western Region in October 2004 were controlled by the national control units and prevented from expanding further. In subsequent years, at least three new outbreaks were effectively contained in the Central Region, preventing a major upsurge that could have affected the entire region. In 2007 the worst Desert Locust outbreak in 15 years developed in Yemen, but was brought under control within three months, facilitated by unprecedented rapid release of emergency funds provided under the United Nations Central Emergency Response Fund.

**Wheat rust.** FAO's Wheat Rust Disease Global Programme was launched in 2008, based on the EMPRES Desert Locust approach, to support countries at risk in strengthening their preparedness capacities to prevent and manage the spread of rust diseases. Under the framework of the Borlaug Global Rust Initiative, FAO works with the International Centre for Agricultural Research in the Dry Areas (ICARDA), the International Maize and Wheat Improvement Centre (CIMMYT), Cornell University, national programmes and the donor community. The objective of the Initiative is to establish priorities and coordinate global activities to safeguard the food security of wheat-producing countries. As part of the programme, rust-resistant varieties are being tested and promoted in at least ten countries.

**Rinderpest.** In 1994, under the EMPRES Livestock component, FAO launched the Global Rinderpest Eradication Programme (GREP) as an international coordination mechanism to promote eradication of the disease by 2010. Due to GREP's efforts, the last outbreak of rinderpest was recorded in Kenya in 2001, the last time the vaccine was used was in 2006, and in June 2011, the Directors-General of FAO and the World Organisation for Animal Health (OIE), announced global freedom from rinderpest – marking the first ever eradication of an animal disease and the second ever eradication of a pathogen. The first, smallpox, was declared eradicated in 1980.

The United States Agency for International Development (USAID), the EU, and the United Kingdom's Department for International Development (DFID) provided most of the financial support for GREP, earmarked to improve research and diagnostic techniques, strengthen national laboratory services, assist national veterinary services in surveillance, coordinate regional vaccination campaigns, develop strategies to respond to re-introduction of the disease, and continuously monitor the global rinderpest situation.

Prior to the initiation of mass vaccination campaigns, disease caused around 100 000 cattle deaths per year in Africa, and veterinary services carried out more than 30 million vaccinations each year, yet outbreaks still occurred. Destruction of

PHOTO 23

The last outbreak of rinderpest was recorded in Kenya in 2001, the last vaccine administered in 2006, and in June 2011, FAO and the OIE announced global freedom from rinderpest.





virus stocks still kept in laboratories will take several years and will be part of the future GREP activities.

### **Establishing pest and disease intelligence systems**

FAO has established a number of information systems that collate a broad spectrum of information from a wide range of sources with proactive output tailored to enable proactive responses to priority plant pests and diseases.

For example, FAO continuously improves and updates its global Desert Locust Monitoring and Early Warning System with new technologies such as remote sensing imagery of green vegetation and models used to estimate locust development rates. These technologies have significantly increased the chances of detecting likely hotspots of locust developments in the vast recession area. For animal diseases, a joint Global Early Warning System for animal diseases transmissible to humans has been developed by FAO, OIE and WHO. It builds on the added value of the three agencies, combining and coordinating their disease event analysis, early warning and forecasting mechanisms and, in turn, enabling the international community and stakeholders to assist in prediction, prevention and control of animal disease threats, including zoonoses. For fish, FAO has collaborated with the Network of Aquaculture Centres in Asia-Pacific (NACA) and OIE to establish a regional aquatic animal disease surveillance and reporting system, which is now fully integrated in the OIE reporting system. Another outcome of this collaboration is the FAO Aquatic Animal Pathogen and Quarantine Information System, a Web-based information system providing aquatic animal health information within the aquaculture landscape.

### **Providing emergency response and development assistance**

FAO provides assistance in efforts to contain emergencies and supports capacity development in pest and disease response at country and regional levels.

- *Desert Locust*. FAO provided emergency assistance to reduce the risk of various locust outbreaks and upsurges to food production in Timor Leste and Indonesia in 2007; the Sudan, Ethiopia, Eritrea and Yemen in 2007/2008; Tanzania, Malawi and Mozambique in 2008/2009; Georgia in 2009; and Madagascar in 2010.
- *Rift Valley fever*. When RVF was detected in sheep in Namibia in 2010 after an absence of 25 years, FAO deployed a veterinary team at the request of the Namibian Government to provide guidance in outbreak control. By stopping the movement of cattle, sheep and goats from, into, within and through the affected regions and suspending animal auctions, it was possible to bring the outbreaks under control.
- *Epizootic ulcerative syndrome (EUS)*. When EUS was first confirmed in the Chobe-Zambezi River system, Botswana, in 2007, FAO provided emergency and technical assistance on EUS to seven bordering countries. Assistance included targeted capacity development in basic diagnosis, active surveillance,



risk analysis, and strengthening of a regional resource laboratory. EUS now affects four countries sharing the system with implications for negative impacts on native fish species; the communities dependent on fishing and aquaculture in the affected region; and risk of further spread to other natural water bodies in the African continent.

### **Supporting the Food Chain Crisis Management Framework**

The human food chain faces continuous threats from increasing outbreaks of aquatic and transboundary animal diseases, plant pests and diseases, and food safety emergencies. Avian influenza, H1N1, cassava diseases, locust infestations, Salmonellosis and dioxin are some examples of threats to the human food chain that can have a potential impact on human health, food security, national economies and global markets. Through its Food Chain Crisis Management Framework, FAO assists its members in addressing the risks to the human food chain, especially the assessment, management and communication dimensions of the risks involved through a comprehensive, interdisciplinary approach.

#### **■ FAO's proactive approach yields benefits**

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Many countries have made substantial progress in reinforcing their preventive management capacities with regard to threats of transboundary pests and diseases. However, given that today diseases spread faster than ever, their potential consequences for food security, human health and ecosystems also escalate. Developed and developing countries now share a global commons of disease risk and would greatly benefit from a strong international response and capacity development on the principles and lessons of FAO's proactive EMPRES approach to disease prevention and control.

This approach to disease risk management can only be implemented with the appropriate support from pertinent national and international actors in line with their strengths and core competencies. Foresight capacity should rest in the hands of already established centres of disease control and prevention in close collaboration with academic centres of excellence and the respective disease foreknowledge units at FAO and WHO.

Most importantly, early reaction capacity to tackle diseases as they arise falls within the remit of countries and their public and private health systems. Domestic institutions need to be equipped with the financial, technical and human resources to support the first and second line of defence. The private sector needs to play an important role as a catalyst of change, by embracing measures to reduce risks and collaboration with national public entities. CSOs, which are in close proximity to the realities on the ground, should liaise more frequently with national and international agencies to complement pest and disease control systems after careful identification of operational gaps and overlaps.

Global partnerships are needed to address the pressing problem posed by pests and diseases of plants and animals. However, endeavours of the required magnitude

need to be championed by strong advocates who support a holistic and proactive approach to sustainable disease risk management.

## Increasing agricultural production and productivity

With the increasing demands of a growing population, the world must now produce more food and other commodities from the same area of land. As reiterated several times in this book, a 70 percent increase in agricultural production will be needed to feed the projected world population of 9.2 billion in 2050. The task is further complicated by the limited availability of land for expansion; poor and declining quality of land and soil resources; and compromised resilience of ecosystems in the face of climate change effects.

In most developing countries, there is little or no additional land suitable for agriculture. It is therefore estimated that 80 percent of the required extra food production will need to come from increased yields and productivity. In the past, many of the agricultural practices responsible for yield increases, such as fertilizer use, irrigation, pesticide use and intensive tillage, have often had significant environmental costs (FAO, 2010h). Today it is generally recognized that well-managed ecosystems are essential for ensuring a healthy resources base on which to intensify in a sustainable manner. To increase the productivity of agro-ecosystems now and in the future, farming practices need to shift away from a heavy dependency on non-renewable inputs and chemical-based products towards other forms of intensification, which complement natural biological processes and biodiversity.

### ■ Sustainable agricultural intensification

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Sustainable intensification has been defined as producing more from the same area of land while reducing negative environmental impacts and increasing contributions to natural capital and the flow of environmental services (Godfray *et al.*, 2010). Sustainable intensification of crop and livestock production is characterized by a systemic approach to managing natural resources, and it draws on a set of environmental, institutional and social principles. When effectively implemented and supported, sustainable agricultural intensification provides the “win-win” outcomes required to meet the dual challenges of feeding the world’s population and protecting the planet. Adopting a sustainable intensification approach has multiple benefits for food security and environmental health and could be implemented in the short term over large production areas.

FAO works to help countries achieve sustainable increases in agricultural productivity by providing technical and policy assistance in four areas:

- increasing agricultural productivity through improved use of resources to achieve higher yields while promoting the sustainability of the production and farming systems;

- enhancing sustainable crop and livestock protection, with a focus on animal diseases and crop pest and pesticide-related issues;
- managing biodiversity and ecosystem services, including through the identification and use of mechanisms for valuing agricultural biodiversity and ecosystem services, and sound agronomic and land management practices;
- strengthening livelihoods, by applying the benefits of increased productivity and diversification within the value chain (to be achieved within an institutional framework of global and regional instruments, treaties, conventions and codes).

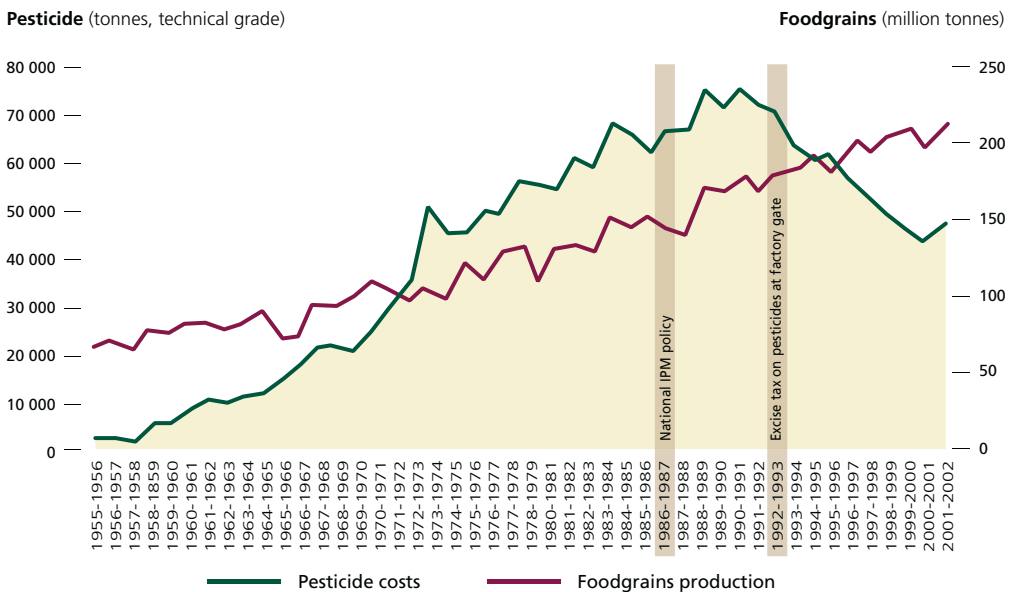
In addition to working at the field level, FAO also contributes at the international level by encouraging dialogue between the agriculture and environment sectors, and among public, private and civil society sectors. It also works to harmonize and improve adaptation of existing international instruments, conventions and treaties relevant to production intensification, often in partnership with other institutions.

## Crops

Agricultural inputs such as seed, fertilizer, land, water, chemical pesticides or biopesticides, power and labour complement the biological processes supporting plant growth. These biological processes include the action of soil-based organisms

FIGURE 27

### India: Annual foodgrains production versus total pesticide use (1955-2002)



Source: FAO, 2009m.

that allows plants to access key nutrients, to maintain a healthy soil structure which promotes water retention and the recharge of groundwater resources, and to sequester carbon. They also include such actions as pollination and the natural predation that leads to pest control (FAO, 2009m). Utilizing information on these supporting biological processes can help farmers boost the efficiency of conventional inputs.

Agricultural practices and adapted production systems that manage ecosystem services to improve productivity and reduce environmental impacts have developed over time. FAO works with countries on approaches such as integrated plant nutrient management, integrated agriculture-aquaculture, integrated pest management, conservation agriculture, organic agriculture, integrated crop-livestock systems, agroforestry systems and integrated weed management as well as pollination management, all of which aim for sustainable improvement in productivity.

***Integrated pest management*** is an ecosystem approach to crop production and protection that encourages natural predation as a corollary to reducing the overuse of insecticides. It also combines management strategies and practices such as cropping management practices, biological control agents – including biopesticides – and the judicious use of relatively safe pesticides. In practice, countries such as India, Indonesia and the Philippines removed insecticide subsidies and reduced insecticide use by 50 to 55 percent, yet rice production continued to increase annually. In India, from 1994 to 2002, total food grain production rose by more than 20 percent while pesticide use fell by more than 35 percent.

***Efficient water management*** is a key to sustainable crop production intensification. Experts estimate that in developing countries, about 20 percent of all arable land is irrigated yet it accounts for 47 percent of all crop production and almost 60 percent of cereal production. Feeding 9 billion people requires the expansion of irrigated areas as well as the wider use of management practices that will improve the efficiency of water use, for example water “harvesting” techniques and conservation of soil moisture.

***Integrated plant nutrient management*** and similar strategies call for the combined use of mineral, organic and biological resources to balance the use of limited resources and ensure ecosystem sustainability against nutrient mining and degradation.

***Animal pollination services*** make an estimated US\$214 billion contribution to the global economy, representing 9.5 percent of the value of world agricultural production used for human food in 2005. Crops that depend on pollination services have average values of US\$1 060 per tonne, compared with US\$211 per tonne for crops that do not depend on animal pollination (Batello *et al.*, 2010). Pollinator-friendly management practices, in multiple agro-ecosystems and ecologies, enhance yields, quality, diversity and resilience of crops and cropping systems. A number of

## BOX 33

### Development assistance to farmers in remote areas of Montenegro and Kosovo

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Since 2006, in the northeastern region of Montenegro and the Shara Mountains of Kosovo, an FAO project funded by Luxembourg has been promoting the improvement of rural household income through support to livestock production and livestock products marketing. The project has provided technical training and field demonstrations and has facilitated the creation of associations, generating significant benefits for the farmers who, on average, managed to triple their incomes.

Working on the premise of inclusive and comprehensive consultation and decision-making, farmers were invited to describe their needs and the type of income-enhancing support required. Two components in particular were defined: a *winter training programme* and *key farmers*. Key farmers were usually rural entrepreneurs and they subsequently made significant contributions to the project's activities and success by serving as group leaders and peer trainers as well as mentors for the young. For example, at one winter training workshop in Montenegro, the need for more assistance in silage production was expressed. Drawing on the expertise made available and grass-silage techniques demonstrated by the project, one Farmer's Association President was able to generate a fourfold increase in annual income. He also highlighted how this transfer of animal nutrition expertise helped to allay his anxieties about the source of feed for his cows during the long, pastureless winter months.

In 2010 together with the Agrosjever Farmers' Cooperative the project organized joint programmes for *certified seed production* in Montenegro. This was the first such undertaking in the country and resulted in improved seed quality that is more disease resistant and generates higher yields and incomes.

*Wool storage* had been a major problem for Montenegrin fleece farmers for ten years, with the common practice being that of burning most of the unsold wool. An alternative sustainable wool market option was proposed by farmers during a participatory cooperative meeting, with start-up and technical support from the project. In 2010 the cooperative was able to meet all EU wool export standards, with the first truckload being exported to the United Kingdom. Today, the members of the farmers' cooperatives run the business alone and have invested in modern equipment and additional training, particularly for the new cooperative members.

*Improved milk production* has also benefited from the project's support. The production and marketing of traditional soft-white cheese from mountain-grazed sheep and cows was hampered by storage and transporta-

tion problems, often compounded by payment difficulties. These factors rendered this type of cheese production challenging and financially risky. Interested farmers received specialized comprehensive training in product diversification, resulting in a semi-hard nationally recognized quality product. Cheeses from two of the units, Komovski and Koritski, received top awards in 2011 at national and international food and agriculture fairs in the region.

This positive experience with a participatory approach prompted FAO to extend the reach of the project to the young people of the region as a means of stemming migration and addressing demographic changes, two factors that threaten the sustainability of mountain farming. With FAO's support, Young Farmers' Clubs have been established, which provide opportunities for agricultural training and social and voluntary activities. Young people, particularly girls, are encouraged to decide on the activities they wish to see organized and identify their training needs. The result is a win-win situation for the young people as well as for the region, as young participants are motivated to view farming as a noble profession and, together with older club members, to move away from low-output, small-scale subsistence farming systems towards modern but sustainable activities that harness the regions' abundant natural resources.

practices exist that favour pollination services, for example preserving wild habitat; managing cropping systems; cultivating shade trees; managing bee nest sites; reducing application of pesticides and the associated risks; and establishing landscape configurations.

**Conservation agriculture** is a production method based on three principles: minimum mechanical soil disturbance; permanent organic soil cover; and diversification of crop species grown in sequences or associations. Conservation agriculture practices can create stable living conditions for micro- and macro-organisms, providing a host of natural mechanisms that support the growth of crops. It also results in significant efficiency gains and decreasing needs for farm inputs, in particular power, time, labour, fertilizer, agrochemicals and water. Furthermore, in many environments, soil erosion is reduced to below the soil regeneration level or avoided altogether, and water resources are restored to levels that preceded putting the land under intensive tillage.

**Well-integrated crop and livestock systems** increase the diversity and environmental sustainability of smallholder production systems. This intentional integration reflects a synergistic relationship among the components of crops (including pastures and trees) and livestock which, when appropriately managed, results in enhanced social, economic and environmental sustainability.

## Livestock

Since the 1960s, beef production has more than doubled and production of poultry meat has increased tenfold, while milk and egg production has increased by 30 percent. These increases have been achieved through both an expansion of stock numbers and an increase in productivity. They have been accompanied by major changes in land and water use. A considerable expansion of arable land, much of it resulting from deforestation, has been devoted to cultivation of cereals and pulses (soybean) for use in animal feed. Approximately one-third of global grain production is now channelled through animals as feed.

Further increases in stock numbers are inevitable, but sustainable growth will depend mainly on increases in productivity and a reduction in losses and wastage. Increasing productivity, producing more from the same or fewer inputs, requires optimization of the use of primary inputs such as land, feed and water.

Poor animal nutrition, probably the major constraint to animal production, has a wide-ranging effect on growth, reproduction, yields (milk and eggs) and disease resistance, as well as a significant impact on the environment through emissions. The intensive commercial poultry, pig and milk sectors are well aware of the importance of balanced nutrition, which has been a major cause of the increased productivity in these systems. However, where livestock depends largely on crop residues, their diets are invariably deficient in nitrogen and minerals. Balancing the nutrients in crop residue-based diets leads to a better utilization of feed resources and higher animal productivity. This can be achieved with protein supplements, such as cottonseed cake or with urea-molasses multinutrient blocks. Work is ongoing on the efficient utilization of existing feeds but also efforts are being made to explore and exploit novel feeds that are less competitive than the cereals and pulses that can be consumed directly by humans.

**Animal breeding.** Conventional breeding techniques have been a major factor in increasing animal productivity. Whereas most of the genetic gain has occurred in developed countries, developing countries also have opportunities to make substantial genetic improvement. There has been virtually no within-breed selec-

PHOTO 24

Increasing livestock productivity requires optimization of the use of primary inputs such as land, feed and water.



tion of local breeds, largely owing to the lack of the necessary institutional infrastructure. Crossbreeding in cattle can result in substantial increases in productivity when combined with adequate management. Crossbred dairy cows are making an increasing contribution to milk production in emerging dairy sectors. Increasingly, future changes will be met by application of new molecular genetics techniques, especially with the complete genome map for farm species. Although there will be challenges, advances in genomics are likely to revolutionize animal breeding.

***Pest and diseases.*** Diseases and parasites that do not necessarily lead to high mortality but still impact animal performance can have serious effects on farm-level productivity. Major transboundary diseases also adversely affect local and international trade. While the eradication of rinderpest is clearly a major achievement, the emergence of avian (H5N1) and pig (H1N1) influenzas, and the spread of diseases such as African swine fever, remain major concerns. Some diseases influence land use – trypanosomiasis, a disease of ruminants in Africa, limits livestock production in areas infested with the tsetse fly. This also impacts on the surrounding agriculture by reducing the options for animal traction. Effective disease control measures exist for many diseases, the issue remaining one of implementation.

***Mixed systems.*** In pastoral communities, where the livelihoods of many people are highly dependent on livestock, any sustainable intensification will come from reducing pre-weaning losses, which can be achieved relatively easily and cheaply with good husbandry, inexpensive vaccines and strategic supplementary feeding. However, throughout much of the developing world, mixed crop-livestock farming remains the predominant production system. Animals utilize the crop residues, spent grains, cultivated fodders and fallow land grazing. Fodder legumes that fix nitrogen, such as lucerne or berseem, are commonly grown for animals as part of the crop rotation. Animals provide power for cultivation and manure as an organic fertilizer or fuel.

Small- to medium-scale commercial animal production may flourish where there is reliable access to markets, goods and services (including credit) which are major determinants for investing time and money in such enterprises. In these systems, changes are market driven and occur where market opportunities exist. Access to markets also exposes producers to competition from the large-scale commercial sector and consumer demand for safer, more ethical (animal welfare) and higher quality products.

***Intensification.*** Highly efficient, capital intensive, large-scale production systems that evolved in the developed world are increasingly found elsewhere. Intensification, often associated with concentration, also increases the problem of pollution, effluent disposal and bio-security. Furthermore, the close proximity of high concentrations of humans and animals increases the public health risks associated with known and emerging new zoonoses. New approaches based on nanotechnology, automa-



tion and molecular genetics have the potential to increase efficiency in producing meat, eggs and milk in these large-scale production systems. However, these systems are likely to become increasingly controversial as means of providing safe, ethical and environmentally neutral products.

## ■ Biotechnology

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Biotechnology in food and agriculture, particularly genetic engineering, has become the focus of a global war of rhetoric. Supporters hail genetic engineering as essential to addressing food insecurity and malnutrition in developing countries and accuse opponents of crimes against humanity for delaying the regulatory approval of potentially life-saving innovations. Opponents claim that genetic engineering will wreak environmental catastrophe, worsen poverty and hunger and lead to a corporate takeover of traditional agriculture and the global food supply. They accuse biotechnology supporters of “fooling the world”.

The Green Revolution, while not without shortcomings, illustrated that technological innovation – higher-yielding seeds and the inputs required to make them grow – can bring enormous benefits to poor people through enhanced efficiency, higher incomes and lower food prices. This virtuous cycle of rising productivity, improving living standards and sustainable economic growth lifted millions of people out of poverty. Yet many remain trapped in subsistence agriculture. The question is whether the current “gene revolution” can reach those left behind.

Today’s rapidly urbanizing global population demands a wider range of quality attributes from agriculture, not just the quality of the products themselves but also of the methods used in their production. The agriculture sector will need to respond in ways beyond the traditional focus on higher yields, addressing the protection of environmental common goods, consumer concerns for food safety and quality, and the enhancement of rural livelihoods both in developed and developing countries.

There is clear promise that biotechnology can contribute to meeting the challenges. It can overcome production constraints, speed up conventional breeding programmes and provide farmers with disease-free planting materials. It can create crops that resist pests and diseases, replacing toxic chemicals that harm the environment and human health, and it can provide diagnostic tools and vaccines that help control devastating animal diseases. It can improve the nutritional quality of staple foods, such as rice and cassava, and create new products for health and industrial uses.

Biotechnology is not a panacea, however. It cannot overcome the gaps in infrastructure, markets, breeding capacity, input delivery systems and extension services that hinder all efforts to promote agricultural growth in poor, remote areas. Some of these challenges may be more difficult for biotechnology than for other agricultural technologies, but others may be less difficult. Technologies that are embodied in a seed, such as transgenic insect resistance, may be easier for small-scale, resource-poor farmers to use than more complicated crop technologies that require other inputs or complex management strategies. On the other hand, some biotechnology

packages, particularly in the livestock and fisheries areas, require a certain institutional and managerial environment to function properly and thus may not be effective for resource-poor smallholders.

The safety and regulatory concerns associated with transgenic crops constitute a major hurdle for developing countries, because many lack the regulatory frameworks and technical capacity necessary to evaluate these crops and the conflicting claims surrounding them. Although the international scientific community has determined that foods derived from the transgenic crops currently available on the market are safe to eat, it also acknowledges that some of the emerging transformations involving multiple transgenes may require additional food safety risk analysis procedures.

There is less scientific consensus on the environmental hazards associated with transgenic crops, although there is general agreement that these products should be evaluated against the hazards associated with conventional agriculture. There is also wide consensus that transgenic crops should be evaluated on a case-by-case basis, as is the case with pharmaceuticals, taking into consideration the specific crop, trait and agro-ecological system. Because very few transgenic crops have been evaluated for their ecological impacts in tropical regions, a major research effort is required in this area. However, apart from a few initiatives here and there, there are no major public- or private-sector programmes to tackle the critical problems of the poor or targeting crops and animals that they rely on. Concerted international efforts are required to ensure that the technology needs of the poor are addressed and that barriers to access are overcome.

### ■ Moving forward with sustainable intensification

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Sustainable production intensification requires an ecosystem approach and an enabling policy and institutional environment that allow different sectors to apply appropriate practices. While the options for moving towards this environment are site-specific, certain approaches are common to most sectors:

- linking public- and private-sector support;
- increasing coordination and reducing transaction costs of incorporating smallholders into the development of sustainable production intensification policies, programmes and strategies;
- incorporating the value of natural resources and ecosystem services into agricultural input and output price policies;
- building regulatory, research and advisory systems for heterogeneous production and marketing conditions (for example, including informal seed systems in seed regulatory policies and integrating traditional knowledge into research and extension);
- recognizing and incorporating customary access and management practices into sustainable production intensification initiatives.

FAO will have a pivotal role in ensuring that agriculture is able to feed a growing and demanding human population equitably, safely and without adversely affecting

the natural resource base or the environment. As a neutral, intergovernmental body, FAO is uniquely placed to advise and guide the future of sustainable agricultural development through analysis of major and often contentious issues, supported by readily available evidence-based information.

## **Agricultural research, technology development and extension**

In the 1960s, the development of new agricultural technologies or innovations was seen as the prime responsibility of National Agricultural Research Institutes and agricultural extension services. In this linear, top-down approach, the national institutes developed new techniques and the farmers adopted them. Extension services were used as a conduit to deliver research findings to the field. This approach was modified in the 1980s into the broader National Agricultural Research System (NARS) approach. The NARS concept recognized that innovation, rather than research, was the driver of development and it could originate with and be promoted by other actors, including farmers, farmers' organizations, the private sector, NGOs and universities.

In 2000, FAO and the World Bank published *Agricultural Knowledge and Information Systems for Rural Development: Strategic Vision and Guiding Principles*. This was the natural evolution of the NARS model and defined the integration of education, research and extension. The triangle used to illustrate this framework highlights the contributions of each of these three components to knowledge development, and the central purpose of the system – to serve farmers. In defining this concept, FAO advocated that farmers be considered partners and custodians, not simply recipients of agricultural knowledge.

### **■ Focus on outcomes to improve effectiveness**

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FAO is one of the key agents of change in defining and using the concept of the Agricultural Innovation System (AIS) to serve the needs and demands of resource-poor farmers and consumers. The AIS concept emerged from the need to shift agricultural research and extension towards development mechanisms centred on outcomes, recognizing that innovation is not a research-driven process that simply relies on technology transfer. Innovation should become a process of generating, accessing, sharing and putting knowledge into use in which stakeholders learn and innovate together, managing the benefits and the risks. The alignment of development policies and resource allocations, the reshaping of research and extension institutions, increasing communication and interactions among all actors and players, and the interactive learning processes as a means of evolving new arrangements specific to local contexts, thus become pivotal to this process of innovation.



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**PHOTO 25**

FAO has been a key player in developing an international architecture for agricultural research and in promoting inter-country collaboration.

### **More effective research and development and extension**

At the global and regional levels, FAO has been a key player in the development of an international architecture for agricultural research, and it was instrumental in promoting intercountry collaboration for research by cosponsoring the establishment and evolution of a number of NARS regional fora. These included the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA), the European System of Cooperative Research Networks in Agriculture (ESCORENA), the Asia-Pacific Association of Agricultural Research Institutions (APAARI) and the Forum of Agricultural Research for Africa (FARA). More recently, it supported the establishment and hosting of the secretariat of the multistakeholder Global Forum on Agricultural Research (GFAR).

FAO has championed the development of these fora, where NARS can voice their priorities, set the international agricultural research agenda, including through the process of the Global Conference on Agricultural Research for Development (GCARD), and pursue a regional approach as a component of their national strategies for agricultural development. This achieves complementary gains by focusing national efforts on specific areas where they have an intrinsic advantage and allows them to work with partners for needs common to a region. FAO played an active part in the process of reform of the Consultative Group on International Agricultural Research (CGIAR) and it also supports the Global Forum on Rural Advisory Services (GFRAS) as well as the Global Consortium of Higher Education and Research for Agriculture (GCHERA).

### **More effective institutions and policies**

After decades of neglect, agricultural innovation systems in many developing countries are weak, fragmented, and poorly linked with farmers and other stakeholders to meet the challenges of ensuring food security, environmental sustainability and reducing poverty.

In research, FAO supports member countries in developing their capacities by formulating research policies and programmes geared to development objectives; strengthening research institutions; creating conducive environments for technology generation and adaptation; and developing human resources.

FAO offers policy advice and technical assistance for the transformation of extension into a pluralistic, demand-led and market-oriented system for member countries, a needed reform for effective agricultural and rural development. This includes tailoring capacity development regarding national policies, and human resource development to national institutional settings. It considers the roles and potential of private firms, NGOs, producer organizations, universities and others along the value chain.

Institutions are witnessing major changes in the ways research outputs are made accessible and communicated – through the application of digital ICTs. It is in this context of the rapidly changing landscape of research communication that a group of major experienced international and regional organizations, led by FAO, GFAR and the CGIAR, came together to combine their experience and to address the issues of coherence and capacity in developing countries and establish the global initiative on Coherence in Information for Agricultural Research for Development (CIARD), aimed at making agricultural research information truly publicly accessible. Partners in the initiative, including an increasing number of national institutions, are coordinating their efforts, promoting common formats for information sharing and exchange, and adopting open information systems approaches. The partners developed a manifesto for change, supported by a checklist of good practices and a set of pathways to achieving the manifesto. A global network of truly accessible outputs of research and innovation is being created, which greatly increases the chance that those outputs can be put to use, locally, nationally and globally.

### **Communication for development**

Since the 1970s, FAO has pioneered communication for development methods and systems that are central to inclusive and efficient innovation systems. Communication for development integrates the systematic design and use of communication strategies and media to improve knowledge, information sharing and the active participation of all stakeholders in an agricultural innovation system. It integrates local and traditional media with use of the new ICTs to improve linkages, knowledge sharing and mediation processes among institutions and stakeholders, leading towards the configuration of new demand-led innovation services. In this context, communication for development strategies and the new ICTs can result in greater and more cost-effective access to information, knowledge and technologies, an improved fit to local conditions and to the promotion of producers' organizations, empowering them and giving a voice to the demand side of extension.

Communication for development projects and services developed by FAO have proven instrumental as strategic components of agricultural innovation systems

**BOX 34****Innovation and Competitiveness for Peruvian Agriculture Programme**

In the late 1990s, the Government of Peru decided to promote agricultural innovation to reform its research and extension system. With a loan from the World Bank and technical assistance from FAO, a programme for Innovation and Competitiveness for Peruvian Agriculture (INCAGRO) was set up as a modern and decentralized agricultural science and technology system. It was designed to be pluralistic, demand-driven and led by the private sector. One of INCAGRO's distinguishing features has been the use of competitive funding schemes to promote a market for agricultural innovation services.

Farmers were the owners of the projects being funded – agricultural service providers were contracted to complete specific activities while farmer groups contributed in cash and in-kind to the projects. The key to INCAGRO's success, which led to a new demand-driven market for agricultural innovation, was that it enhanced the power of the clients to formulate, cofinance, regulate, implement, monitor and evaluate extension services through the mechanisms and tools of the competitive funds. It thereby created a situation in which farmers' voices were heard and their demands became authentic drivers of agricultural innovation.

in improving the generation and sharing of knowledge among rural people and in enhancing the linkages among research, advisory services and their clients. Communication for development plans and strategies have also added value in new areas of work related to innovation systems, especially those involving community mobilization and participation, such as climate change adaptation, disaster risk reduction and natural resources management. In 2006, the First World Congress on Communication for Development took place in Rome, jointly organized by FAO, the World Bank and the Communication Initiative Network.

**Technical assistance**

FAO advocates a shift from interventions focusing on single components towards a system approach aimed at strengthening institutional and stakeholder networks to facilitate the development of an inclusive and integrated agricultural innovation system that is tailored to the needs of smallholder farmers. Through its technical assistance programme, the Organization supports participatory processes for improving national agricultural innovation systems by involving key stakeholders, including producers and their organizations, in assessing research and extension systems and planning interventions to improve these systems at policy, institutional, human resources and technical levels.

Considering the great potential offered by recent advances in life sciences, FAO has also been active in developing national capacities in biotechnology policy development and biosafety. Intensive efforts have been made to provide neutral, balanced information on biotechnology, to enable policy-makers and managers to make informed decisions. The FAO International Technical Conference on Agricultural Biotechnologies in Developing Countries, held March 2010 in Guadalajara, Mexico, offered countries a neutral forum to discuss how to promote the use of biotechnologies to meet development objectives.

### **Knowledge into use**

New agricultural innovation system tools focus on facilitating innovative exchange and the use of knowledge and technologies to achieve social and economic advancement. The examples below illustrate some of the FAO contributions.

*Virtual Extension and Research Communication Network (VERCON)* employs Internet-based technologies and communication for development methodologies to strengthen linkages among agricultural policy, research and extension institutions and other key stakeholders. It uses ICTs and participatory communication techniques to connect geographically dispersed people and facilitate networking among various institutions and individuals. FAO has supported knowledge and communication systems based on the VERCON concept in several countries throughout Africa, Asia, the Near East, Latin America and Central and Eastern Europe.

*Rural radio* has been a focus of FAO for more than 20 years, particularly in Africa. FAO has helped build rural radio methodology on the principles and approaches of communication for development. Community participation is a fundamental characteristic of rural radio. Live public shows, village debates and participation in the actual management of the radio station empower rural people to participate in the dialogue and decision-making processes essential for them to control their own economic, social and cultural environment and play an active part in development activities.

## **National and regional programmes for food security**

In 1990–1992, when improved agricultural production technology made it possible to produce enough food to feed a world population of more than 5 billion, 816 million people, or 20 percent of the developing world's population, remained undernourished. The moral injustice of this paradox led FAO to launch an ambitious initiative to make simple but improved agricultural production technologies accessible to the large numbers of poor farmers in developing countries – those who had been bypassed by the economic and technological progress that had led to the

reduction of hunger elsewhere. This initiative was the Special Programme for Food Security (SPFS).

## ■ Special Programme for Food Security

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The SPFS was launched in 1994 to support member countries in undertaking action against hunger and malnutrition on a scale sufficient to achieve a significant reduction in undernourishment. The initiative was endorsed by the World Food Summit in 1996.

### Pilot phase

While the aim of the SPFS was to reach out to large numbers of poor farmers around the world, it did so in a phased manner. In its first decade (1994–2005), essentially a pilot phase, small-scale demonstration projects were implemented in 105 countries, reaching out to an estimated 1.5 million people. The purpose was to demonstrate how hunger and malnutrition could be reduced by helping small-scale farmers improve productivity, reduce year-to-year production variability and increase farm incomes and food availability by forming local self-help groups and adopting simple low-cost technologies.

The design of the pilot projects started with a participatory constraints analysis aimed at identifying practical problems faced by farmers and offering technical solutions centred on three main areas: improved water control, sustainable intensification of crop production, and diversified production. Following the demonstration phase, the widespread application of successful technologies by small-scale farmers (the “scaling-up” phase) was expected to contribute to food security by improving and stabilizing food availability at the national level; increasing the availability, stability and access to food; and enhancing the nutritional quality of diets.

### Scaling-up phase

The period 2001–2002 was an important milestone for the SPFS. An independent evaluation concluded that while the programme remained highly relevant, its scope needed to broaden to include all four dimensions of food security, and the scale of its outreach needed to increase significantly. The evaluation’s findings were echoed by the World Food Summit: *five years later*, which concluded that, despite the commitments made at the 1996 Summit, too little action had been undertaken globally towards eradicating hunger.

Recognizing that time for meeting the hunger targets set by the summit and the MDGs was running out, the focus of the second phase of the SPFS was redirected towards direct action to tackle food insecurity through large-scale and more comprehensive national and regional programmes for food security (NPFS/RPFS). Such programmes were to be designed, owned and implemented by national governments and REIOs, and the objective was to achieve the WFS and MDG 1 targets by 2015. FAO facilitated the process of programme development, assisting



**PHOTO 26**

The FAO Micro-Gardens Project in Senegal, initiated through the FAO Special Programme for Food Security (SPFS), promotes horticultural production in unused and unusual spaces.



in mobilizing resources from governments, international financing institutions and other resource providers, and providing its own technical assistance as well as that provided through the SPFS South-South Cooperation initiative (introduced in the following section). By the end of 2010, 20 countries were implementing national programmes for food security and regional programmes were operational in four regions: the Caribbean Community, the Pacific Islands Forum, the West African Economic and Monetary Union, and the Economic Cooperation Organization (an intergovernmental organization involving seven Asian and three Eurasian nations). By 2014, the number of large-scale national and regional programmes is expected to double.

During the second phase of the SPFS, the number of direct beneficiaries increased to around 30 million, as more and more countries scaled up their actions through national and regional programmes. Africa, where national programmes for food security are already operational, has nearly 20 million beneficiaries. Factoring in the number of people who benefit from non-targeted outreach activities and spillover effects, the number of beneficiaries could reach as high as 80 million over the next five years.

### **South-South Cooperation**

Since 1996, South-South Cooperation (SSC) has been an important pillar of the SPFS outreach strategy. By making the know-how of technicians and experts from emergent developing countries available to extension agencies and rural communities in less developed recipient countries, FAO's SSC initiative has been an essential vehicle for knowledge transfer among developing countries. By the end of 2010, a total of 49 SSC agreements had been signed to provide technical assistance among developing countries and more than 1 500 experts and technicians had been fielded within the framework of the SPFS. At present, FAO is supporting the development of strategic SSC alliances with selected countries in support of national and regional programmes for food security.

## Impacts of the SPFS

The pilot phase demonstrated how intensification and diversification technologies, when accompanied by access to improved inputs and management skills, can increase yields in a way that is sustainable. Increases ranging from 25 to 135 percent were observed for major staple crops such as wheat, rice, maize, sorghum and cassava. The Sudan obtained a remarkable 350 percent increase in sorghum yields through a combination of deep ploughing, bund construction and planting of improved varieties. Rice yields increased by almost 200 percent in Ghana and by around 400 percent in Guinea.

Participatory extension methodologies played an essential role in the programme's technology transfer strategy. Strengthened village and farmers' organizations and the creation of small banks and revolving credit schemes were fundamental to the success of the SPFS in countries such as Mauritania, Nigeria, Pakistan and Tanzania. Farmer field schools produced very good results in Cambodia, Mozambique, Sierra Leone and Tanzania.

An important indicator of success was the rate at which new technologies and practices were adopted. The adoption of improved crop varieties was usually accompanied by improvements in the management schemes for regular supply of improved seeds and for marketing the crops. In Tanzania, success with small livestock prompted the government to support the provision of improved breeds. In Honduras, the demonstration of practices for maintaining soil humidity and using drought-resistant maize varieties and agroforestry led to their wider uptake. In several countries, poor farmers were introduced to and adopted gravity irrigation as a cheaper alternative to pump irrigation.

## Food security

SPFS activities often produced direct positive food security impacts among participating households. Increased productivity of staple cereals led to shorter periods of seasonal food shortages. Income derived from diversification activities meant that farmers were able to rely on other sources of income and did not have to sell their crops at harvest time when prices were lowest. In Nigeria, average incomes of participating households increased from around US\$300 to around US\$750, which allowed them to invest in assets such as metal roofs, motorcycles and cell phones. Some locations showed a 50 percent reduction in the number of farm households eating fewer than three meals per day. In Colombia, the SPFS contributed to increased availability of home-produced staples (banana, yam, maize, beans), vegetables and protein-rich foods (meat, eggs, cheese), and reduction in child malnutrition (wasting: from 38 to 32 percent, stunting from 57 to 54 percent, underweight from 55 to 50 percent).

The SPFS also led to various forms of social capital formation. Countries with strong rice irrigation programmes benefited from formation and strengthening of water user groups for management of small-scale irrigation infrastructure and water distribution. Savings and credit groups run by local people generally proved sustain-

able. In Mali, farm groups benefiting from diversification activities dealt directly with the decentralized financing institutions to fund their production and marketing activities. The revolving fund provided by the Libyan-funded project, in addition to their own savings, was used as collateral by farmer groups. In SPFS projects in Bangladesh, Indonesia, the Lao People's Democratic Republic and Sri Lanka, communities prepared farmer group development programmes to guide improvement for all SPFS site development. These programmes included revolving funds for seed, livestock and other assets as well as capacity development through field schools, farmer-to-farmer exchanges and community workshops.

SPFS activities often had important spillover effects whereby the adoption of new technologies and practices spread beyond the initially targeted sites. This resulted in increased local and national investments in food security, programme visibility and commitment of national authorities. Guatemala's 2005 National Food Security Law was developed through a broad-based multistakeholder process that FAO's SPFS support team in the country helped to facilitate.

### **National and regional programmes**

Since the start of the second phase of the SPFS in 2002, 20 countries and four REIOs have embarked on the implementation of large-scale programmes for food security, supported by political commitment at the highest level and embedded in broader national and regional efforts to achieve the MDGs, as well as national objectives such as equitable economic growth, sustainable agriculture, poverty reduction and rural development. Programmes are tailored to country-specific needs and priorities, and they typically receive significant funding from the national government budget. National programmes have often scaled-up their successful SPFS pilot experiences.

*Indonesia* incorporated the community empowerment approach that was successfully piloted by the SPFS in the country's General Food Security Policy: 2006–2009. Programme participants in selected target villages formed farmer groups. With support from extension workers, the groups selected and implemented a variety of activities that would help them improve their livelihoods. A nationwide village food resiliency programme, initiated in 2006 in 250 villages in 122 districts, has now been extended to 1 174 villages in 275 districts in 33 provinces, and a further extension is foreseen for 2010–2014.

*Mexico* established decentralized rural development agencies through the Strategic Project for Food Security to promote and develop capacities of individuals and rural communities to define their own problems and identify viable solutions. Currently 135 agencies are operating in 18 states and 655 districts, including 105 of the 125 districts with the lowest human development indices in the country. More than 100 000 poor families have participated directly in community-level projects, focusing both on improving living conditions (housing, stoves, water tanks, grain storage, poultry and vegetable gardens) and on expanding productive options (soil

and water management, organic coffee, maize and beans, marketing, ecotourism). Funding comes from the federal budget and has steadily increased in response to local demand.

*In Africa*, NEPAD's Comprehensive African Agricultural Development Programme (CAADP) – introduced in Chapter 5 – has provided an important framework for action against food insecurity. The 2007–2008 food price crisis accelerated CAADP's country roundtable process as well as the mobilization of significant funding for the programme's food security pillar. Malawi and Togo are two examples of how the NPFS was used as a building block for developing a CAADP action plan for this pillar. This work has been important for countries that opt to work through sectoral or cross-sectoral programmes, rather than channelling investments in food security through stand-alone programmes.

*Malawi* was assisted by FAO in 2005 in the formulation of a strategic framework for a National Action Plan for Food Security and Nutrition. The document built on SPFS successes in enhancing smallholder productivity and introduced additional components to address the food security needs of the landless poor. Some priority components were selected for immediate implementation but most were included in Malawi's Growth and Development Strategy. After its release in November 2006, this became the framework for all subsequent sectoral and cross-sectoral development programmes in the country. Within the framework of the strategy, the Government of Malawi and its development partners formulated and endorsed an agricultural development programme, called the Agriculture Sector Wide Approach, which has a food security pillar and now constitutes the country's national programme for food security.

Togo validated its NPFS in December 2008 through a broad-based consultative process involving all stakeholders at different levels. It was conceived as a cross-sectoral food security strategy that covers the four dimensions of food security as well as a plan of priority actions and investments for the period 2008–2015. During 2009 the programme was incorporated into the poverty reduction strategy framework and served as the basis for a stakeholder meeting on the approach to be followed for developing a national agricultural investment programme. At this meeting it was decided that five of the six components of the national programme fit comfortably within the orientations of the CAADP.

### **SPFS vision remains relevant**

Seventeen years after the launch of the SPFS, despite remarkable technological and economic achievements, the number of undernourished has not diminished but has increased – to nearly 1 billion in 2010. While new challenges such as climate change, the recent food price crises and the global economic and financial crisis certainly contributed to this lack of progress, it is also widely accepted that chronic underinvestment in smallholder agriculture, food security and rural development over the past few decades is the major reason for the world's failure to reduce the number of undernourished.

In those countries where the SPFS has been able to mobilize significant investment in food security through national and regional programmes, tangible improvements are emerging. There are also signs that the ongoing food and economic crises are giving new impetus to the food security agenda globally and nationally and that investments in food security, agriculture and rural development are on the rise in many countries.

With the paradox that inspired the launch of the SPFS still with us, the vision and strategy of the SPFS remain as relevant today as they were in 1994. It is thus essential for FAO to continue intensifying and expanding its support to countries' medium- and long-term anti-hunger programmes, and also to make greater efforts to draw lessons from past and ongoing programme implementation. Successful programmes benefit from political commitment at the highest level, as has been reflected in the size of the national budget allocations and the diversity of external funding.

## **Food safety, quality and nutrition in a changing environment**

### **■ Increased focus on food safety**

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Food safety became an important item on the political agenda of many countries in the 1990s with the emergence of new food-borne hazards, such as bovine spongiform encephalopathy (BSE), the threat of existing hazards such as cholera and salmonella spreading through international food trade, and the use of growth promoters and antimicrobials and application of new technologies in food production and processing. Increased awareness of these issues also led to the emergence of consumer groups as important stakeholders in shaping food safety policy.

The Joint FAO/WHO Food Standards Programme has fostered the development of international food safety standards within the framework of the Codex Alimentarius Commission since 1963. Scientific advice on the safety of chemicals in foods was already being provided by the Joint Expert Committees on Food Additives (JECFA) and the Joint FAO/WHO Meeting on Pesticide Residues (JMPR).

These existing programmes gave FAO a strong basis on which to build its food safety and quality activities and contribute to the development of a new food safety environment. In 1994, under the WTO agreements on Sanitary and Phytosanitary Measures and Technical Barriers to Trade, the food standards of the Codex Alimentarius became the reference for food safety in international trade. In addition to increasing the relevance of Codex, the agreements also positioned science as the basis for regulatory and trade measures. Considering food safety along the entire food chain became an obvious necessity, which increased the call for capacity development in addressing the specific needs of developing and transition countries.

As the work of the Codex Alimentarius Commission became more important, its membership increased from 144 in 1994 to 185 (184 countries and the European Community). The increased importance of Codex standards also highlighted the

need to ensure that the standard-setting process was as inclusive as possible. Thus, in 2004, the body set up a Trust Fund for Enhanced Participation in Codex specifically to increase the participation of developing countries in the work of the Commission and its subsidiary bodies.

### **Leader in food safety risk analysis**

To ensure that FAO standard-setting processes and scientific advice programmes led the way in meeting WTO requirements, FAO made the development of a framework for food safety risk analysis and risk-based approaches the cornerstone of its food safety activities. Now incorporated into FAO's standard-setting and scientific advice programmes, they strongly influence the means by which technical support is provided to countries in the development of their food control programmes. For example, the *Framework for the Provision of Scientific Advice on Food Safety and Nutrition* (FAO and WHO, 2007) documents the approaches FAO uses when providing scientific advice, requests for which have increased considerably since 1994. The programme, which began by covering chemical hazards, has broadened to include microbiological hazards, new and emerging hazards and technologies, and risk-benefit assessments of various practices, such as the use of chlorine-based disinfectants. For example, the safety assessment of food derived from modern biotechnology, such as engineered plants, animals, fish and genetically modified micro-organisms, is an emerging area that has generated great interest.

### **Improving food safety capacity along the food chain continuum**

Capacity development to ensure the production of safe good quality food for both domestic and international markets is in high demand and remains a critical element of FAO's food safety and quality work. This was emphasized and guided by a series of regional and global FAO/WHO meetings on food safety implemented between 2000 and 2005.

***Technical assistance for capacity development.*** FAO's technical assistance programme in the area of food safety and quality revolves around three main pillars:

- developing policies, institutional and regulatory frameworks for food safety systems at national and regional levels;
- designing risk-based food control programmes and strengthening the technical capacity within a country for their implementation and enforcement;
- promoting the uptake of, and adherence to, good food safety management and operational practices by food chain operators.

Planning and implementing effective food safety programmes requires a multi-disciplinary approach involving all stakeholders from farm to table, including government agencies, food enterprises, academia and consumers. Capacity development programmes are required to enable these stakeholders to perform their functions better and assume their responsibilities in ensuring safety and quality of food for domestic consumption and export. In each biennium, approximately 50 countries receive FAO technical assistance in food safety through projects and other



PHOTO 27

FAO provides guidance on food safety management at the operational level.



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in-country activities. In addition, FAO works with groups of countries in support of greater economic integration and safe movement of goods.

***Outreach builds on technical assistance.*** FAO's food safety and quality technical assistance programme goes beyond direct support to countries and regions. There is further outreach through the guidance, tools and training materials that are developed and made freely available to all interested parties. These include;

- guidelines and tools for improving policy environments, legal and institutional frameworks for effective national food control systems, and effective participation in the international standard-setting mechanisms of the Codex Alimentarius;
- guidance for the assessment of food safety capacity development needs, and manuals and training materials aimed at strengthening technical food control programmes covering risk analysis, food inspection, food analysis, sampling and other specific issues;
- guidance, resource and training material on food safety management at the operational level, including Good Hygienic Practices and Hazard Analysis and Critical Control Points from both a generic and commodity- and hazard-specific perspective (e.g. mycotoxin contamination in green coffee).

To further enhance this outreach, the formats and delivery systems for such material vary according to the intended audience and where appropriate new technologies are used to increase access to training through for example e-learning and Web-based tools.

There are numerous organizations involved in capacity development, making coordination and collaboration critical to ensuring delivery of efficient and effective programmes. FAO, in collaboration with WHO, OIE, WTO and the World Bank, established the Standards and Trade Development Facility in 2002 to facilitate coordination and resource mobilization for capacity development.

### **Food safety emergencies**

At the request of its members, FAO established the EMPRES-food safety programme in the context of the Food Chain Crisis Management Framework. This

serves as a key international system to assist in the prevention and management of global food safety emergencies, and included the three pillars of early warning, emergency prevention and rapid response. Early warning in particular is addressed together with WHO through the International Food Safety Authorities Network.

### **FAO contributes to global call for food safety**

Expectations of the Codex standard-setting process and the scientific advice programmes continue to increase, which requires an ongoing evolution of FAO's approaches. Evolving food production systems and shifting market dynamics are expected to challenge governments to identify emerging hazards, recognize changing food safety and quality priorities, and adapt relevant programmes accordingly. Facilitating the identification of new trends and emerging hazards through the horizon scanning activities of EMPRES and the provision of scientific advice on these are likely to be important aspects of FAO's future work on food safety. Ensuring that food safety concerns are addressed effectively requires an appreciation of food safety's relevance to other areas such as food security, public health and economic development. Achieving this requires improving communication, education and the available tools which facilitate more integrated approaches and addressing food safety under umbrellas such as the One Health initiative, which is a worldwide strategy for collaboration in all aspects of healthcare for humans, animals and the environment. Strengthening multidimensional evidence-based decision-making on food safety policies and strategies in order to guide public investment in food control systems is an important element of this. Capacity development will continue to be critical but will also have to evolve to address the ever-changing environment of food safety and quality.

### **■ Nutrition**

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The nutritional well-being of a population is a reflection of the society's social and economic performance and an indicator of the efficiency of national resource allocation. A well-nourished, healthy population is a precondition for sustainable development. Nutritional deficiencies and poor nutritional status affect the mental and physical state of adults, reducing productivity and quality of life. Poorly nourished children are less able to learn. Diet-related chronic diseases are costly to treat. Thus, poor nutrition undermines the agriculture, education, health and other development sectors and lowers the quality of life of individuals.

Millions of people do not have access to food of sufficient quantity and quality to meet their dietary energy needs and their nutritional requirements. Grains, roots and tubers, which are largely carbohydrate, provide most of the energy consumed. Other foods of plant and animal origin provide protein, fats, vitamins and minerals that are needed for growth, maintenance and activity. Diets lacking diversity can threaten health. Underweight, stunting and micronutrient deficiencies affect the development of millions of children and have lasting impacts into adulthood.



Urbanization, sedentary lifestyles and globalization of the food supply contribute to changes in diets, which often contain excessive levels of sodium, sugar and fat. Worldwide, the leading causes of mortality affecting all income groups relate to high blood pressure, high blood glucose, overweight and obesity, which are strongly affected by dietary patterns (WHO, 2009).

### **Supporting a food-based nutrition approach**

FAO endeavours to eradicate hunger and nutritional deficiencies, as well as contribute to the prevention of diet-related non-communicable diseases. FAO advocates a food-based approach as the most sustainable way to prevent poor nutrition. At the 1992 International Conference on Nutrition (ICN) and 1996 World Food Summit, countries made strong commitments to ending hunger and improving nutrition. The strategies laid out at these conferences set a framework for scientific work, policy advice and capacity development activities in nutrition during the 1990s which continue today. A second ICN is being prepared by FAO together with WHO and other members of the United Nations Standing Committee on Nutrition (UNSCN).

### **Providing scientific information on nutrients**

One of FAO's fundamental tasks is the provision of scientific information about nutrients for use by decision-makers and development practitioners. Initially, this work focused on producing information on human nutrient requirements but since 1994, expert consultations and technical meetings have been held on energy, proteins, carbohydrates, fats, vitamins and minerals, often in collaboration with WHO – promoting food composition work to identify the nutritional contents of foods. The recommendations resulting from these meetings are used worldwide and FAO reports are considered authoritative sources for the Codex and national governments.

In 1994, FAO and the United Nations University renewed efforts to support food composition work in developing countries (Lupien, 1994). FAO hosts the International Network of Food Data Systems, which mobilizes resources for improving the quality, quantity and accessibility of food composition data in the developing world. The exchange of data and sharing of technical knowledge is fostered by regional data bases, international food data conferences and international training courses. Technical publications strengthen capacities in developing countries.

### **Promoting nutrition education**

FAO's nutrition education activities at country level aim to influence public policies and promote access to a variety of nutritious foods; increase knowledge of the nutritional value of foods; influence behaviours, attitudes and beliefs; and develop personal skills and motivation to adopt healthy eating practices.

In 1995, FAO and WHO sponsored an expert consultation on food-based dietary guidelines (WHO, 1996). The guidelines are a tool for nutrition education to be used by health providers, teachers, journalists, extension agents and others working directly with the public; they also provide policy guidance for other sectors.

FAO has sponsored more than 20 regional workshops in different parts of the world to promote development of the guidelines and carried out projects to develop capacities in this area in the Caribbean and Africa.

Eating habits are learned early in life, making schools especially important in strategies to improve nutrition. FAO's approach to nutrition education in schools includes curriculum development to teach skills and knowledge that will be used throughout life, such as gardening, food processing, hygiene and food preparation. It has supported work on nutrition in schools in Argentina, Chile, the Bahamas, the Dominican Republic, El Salvador, Honduras and Paraguay.

### **Recognizing the connection between nutrition and agriculture**

Agriculture offers numerous opportunities for improving nutrition. FAO provided assistance for the development of national plans of action for nutrition in the 1990s. Policy briefs and guidelines continue to be tools for incorporating nutrition considerations into agricultural and rural development. A specific connection between agriculture and nutrition where FAO has been particularly active is collaborative work on horticulture and prevention of micronutrient deficiencies. FAO has produced a number of popular books on home gardening and school gardens. Most recently, FAO produced a book that illustrates various food-based approaches to preventing micronutrient deficiencies. It also collaborates with WHO in the Initiative on Fruits and Vegetables for Health, which focuses on prevention of diet-related non-communicable chronic diseases.

### **FAO increasingly integrates nutrition into activities**

Although the work of FAO in nutrition has followed the themes framed by the 1992 ICN, today's realities imply that projects will increasingly be multifaceted and nutrition better integrated with other FAO activities. In the twenty-first century, FAO's nutrition work will place greater emphasis on environmental concerns and sustainability of diets. FAO is leading the crosscutting Initiative on Biodiversity for Food and Nutrition, in collaboration with Bioversity International, and developing tools for addressing these concerns. As urban populations grow and more packaged foods are consumed, FAO will assist in capacity development and the provision of scientific advice related to nutrition labelling. Finally, there will be stronger linkages between the scientific advice on nutrition that is produced by FAO and the work of the Codex Alimentarius.

## **Conclusion**

This chapter has provided an overview of the depth and breadth of FAO's normative and field activities, all of which share the common long-term goal of helping to reduce hunger and ensure global food security. From protecting and enhancing natural resources to increasing agricultural production and ensuring food is safe and nutritious – the list goes on. As shown, these projects and focus areas have been

successful, yielding the results sought in terms of identifying needs of producers and other practitioners in the food and agriculture sector as well as governments and development partners, and then helping them meet those needs.

Yet, in spite of this dedication, greater efforts are needed to achieve poverty and hunger reduction today and in the future. As shown in earlier chapters, new challenges and crises have certainly contributed to the lack of progress made. But it is now widely accepted that chronic underinvestment in smallholder agriculture, food security and rural development over the past few decades is the major reason for the world's failure to reduce the number of undernourished.

It has taken recent events, such as the food and financial crisis, to prompt more concerted efforts by governments and the development community and to reaffirm the importance of issues related to food security on the international agenda.

## CHAPTER 7

# Towards total eradication of hunger in the world

## Translating the vision into sound policy and effective action

Over the past two decades, the world has come a long way in its understanding of the complex causes of hunger and malnutrition, and FAO has contributed significantly to that understanding. In those years, world leaders have come together time and time again to sign up to noble declarations of their intent to end hunger.

At the World Food Summit in 1996, they declared:

*“We pledge our political will and our common and national commitment to achieving food security for all and to an ongoing effort to eradicate hunger in all countries, with an immediate view to reducing the number of undernourished people to half their present level no later than 2015. We consider it intolerable that more than 800 million people throughout the world, and particularly in developing countries, do not have enough food to meet their basic nutritional needs. This situation is unacceptable.”*

Yet, today the number is more than 900 million. While the proportion of the world’s population suffering from chronic hunger may have fallen, the absolute numbers have risen.

In July 2009, some 13 years after the World Food Summit, the G8 Summit in L’Aquila, Italy, produced another statement, uncannily like the earlier one:

*“There is an urgent need for decisive action to free humankind from hunger and poverty. Food security, nutrition and sustainable agriculture must remain a priority issue on the political agenda, to be addressed through a cross-cutting and inclusive approach, involving all relevant stakeholders, at global, regional and national level.”*

The L’Aquila event also obtained pledges of more than US\$20 billion for investment in promoting food security over three years, although, two years on, only about 22 percent of this has actually been spent. In November of 2009, at the World Summit on Food Security at FAO headquarters in Rome, the aspiration was reaffirmed:

*“We, the Heads of State and Government or our Representatives and the Representative of the European Community have assembled in Rome at the World Summit on Food Security to take urgent action to eradicate hunger from the world. In adopting this declaration we agree to undertake all necessary actions required at national, regional and global levels and by all States and Governments to halt immediately the increase in – and to significantly reduce – the number of people suffering from hunger, malnutrition and food insecurity. We will reinforce all our efforts to meet by 2015 the targets of Millennium Development Goal 1 and the World Food Summits. We commit to take action towards sustainably eradicating hunger at the earliest possible date.”*

This chapter looks at the major summits and conferences held in Rome in the last two decades and their contributions to the fight against hunger. It then goes on to look at how the current world situation, with its enhanced market information systems, has supported these efforts, but also indicates gaps that remain. Finally, it discusses efforts underway for strengthening global governance of food security and nutrition.

## **Three World Food Summits and a High-Level Conference**

The World Food Conference, convened in Rome in 1974 under the auspices of FAO, was a novelty. Never before had so many governments and world leaders come together at the highest level to examine the global problem of food production and consumption. The conference was in part a response to the devastating famine that had hit Bangladesh in the preceding two years, as well as the frequent extreme food shortages in many developing countries in Africa and parts of Southeast Asia.

It had become clear that insufficient attention was being paid to hunger and malnutrition and it was hoped that a world conference, attended by representatives of 135 countries, 26 intergovernmental organizations and 161 NGOs, might galvanize policy-makers into taking important steps forward. The sentiment was there, with the United States Secretary of State Henry Kissinger expressing the conviction that the world had acquired the capacity to free humankind from the scourge of hunger and could set for itself a “bold objective: that within a decade no child will go to bed hungry, that no family will fear for its next day’s bread and that no human being’s future and well-being will be stunted by malnutrition.”

The conference endorsed an inspiring proclamation that “every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop their physical and mental faculties”. Governments attending the conference committed to a goal of eradicating hunger, food insecurity and malnutrition within a decade.

The conference established a 36-member ministerial-level World Food Council, to make annual reviews of major problems and policy issues affecting the world food situation. The Council made valiant – if poorly conceived – efforts to bring

political influence to bear on governments and UN bodies, before being disbanded in 1993. However, the World Food Conference also established the Committee on World Food Security (CFS), which continues to serve as a forum to review and follow up on policies concerning world food security and has become one of the major instruments for food security and nutrition governance.

Also thanks to the conference, the world saw new actors arrive on the world stage. The final document called for an organization to finance agricultural development projects primarily for food production in the developing countries, and thus the International Fund for Agricultural Development (IFAD) was set up in Rome in 1977. Many NGOs and other agencies drew energy from its pronouncements. However, more than 20 years later the prospect of eradicating hunger, food insecurity and malnutrition appeared to be as much a chimera as ever. At FAO, where a new administration had come into office in 1994, the perception was that something radical needed to be done.

### ■ World Food Summit – 1996

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In its creation of the short-lived World Food Council, the 1974 conference had mistakenly thought that the world's agriculture ministries represented the proper vehicles for proceeding along the road to achievement of global food security. But that proved not to be the case. FAO's new Director-General, Jacques Diouf of Senegal, realized that the issue needed to be escalated to the level of heads of state and government.

By the early 1990s, the issue of hunger appeared to have fallen off the world awareness map. Food security and related issues were fading from public consciousness. The new FAO chief felt something had to be done to return food security to the global agenda and that the best way was to enlist the help of the mass media. He scheduled a World Food Summit for November 1996.

Scepticism was widespread, but the world's leaders proved strongly receptive to the invitation to confront this issue on a global platform, and of the 186 participating countries, more or less FAO's entire membership at that time, 41 were represented by their heads of state, 15 at the level of deputy head of state, 41 by their heads of government, 15 at the level of deputy head of government and the remainder by other high-level national representatives. The summit was addressed by 176 heads of delegation and by the EU, by speakers for 19 UN agencies, 23 other intergovernmental organizations and 13 NGO caucuses. It was, however, Cuban President Fidel Castro who caught the public attention with his outspoken and scathing condemnation of a world that let people go to bed hungry, allowed children to die of malnutrition, ignored the needs of the world's small farmers, but at the same time spent billions of dollars annually on arms production.

Looking back, the 1996 summit did make a difference. It was the summit's Rome Declaration through which world leaders first promised to cut the number of hungry people by half by 2015, reaffirming the right of everyone "to have safe and nutritious food" and recognizing poverty as a major cause of food insecurity,

While the summit did not result in the immediate eradication of hunger, it did move vital questions regarding food production and availability, nutrition, food safety and food security higher up the agenda of world leaders, politicians, producers and consumers. Naturally, there are other reasons why food-related issues have grown in importance, but the 1996 summit definitely played a key role and, paradoxically, represented the start of a new beginning in FAO's relationship with CSOs, which helped ensure that these issues would remain permanently on the table.

### ■ **World Food Summit: *five years later* – 2002**

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FAO's post-1996 commitment was unflagging. When, four years later, world leaders came together again at the 2000 Millennium Summit at the UN headquarters in New York, they picked up where the FAO Summit had left off. They adopted the Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty, and set a series of eight Millennium Development Goals (MDGs), the first of which was the commitment to fight extreme poverty and hunger.

The MDGs also committed the international community to combat disease, illiteracy, environmental degradation and discrimination against women. But making the elimination of poverty and hunger its number one goal meant FAO's involvement would be decisive. This was, after all, FAO's principal mandate, making it natural that FAO would develop a strategy to support the implementation of the MDGs through advocacy and support to MDG-related initiatives, better targeting of FAO's programmes, pursuit and expansion of strategic alliances and partnerships and proactive participation in country-level cooperation with United Nations partners.

Early in the new millennium, it was decided at FAO that progress towards achievement of the WFS targets and the MDGs was too slow and that another summit was needed to give new impetus to the search for solutions to the problem of hunger and food insecurity. Efforts were marshalled to bring the heads of state and government back to Rome, in June 2002 for the World Food Summit: *five years later*. This time, 180 delegations (179 countries and the EU) participated. At the inaugural ceremony, Kofi Annan, then UN Secretary-General, stressed the need to give hope to the 800 million hungry people of the world through concrete action.

The 2002 meeting drew even more criticism than the 1996 summit, with critics calling it "disappointing" and pointing out the low attendance by developed country leaders. However, wide media coverage served the purpose of heightening awareness of the world's hungry.

It also engendered renewed action and in 2003, an International Alliance Against Hunger and Malnutrition (AAHM) was established to improve coordination of hunger-focused activities at country level. Founded jointly by FAO, IFAD, WFP and Bioversity International, all located in or near Rome, the Alliance has become a multistakeholder platform and forum where those who run top-down and bottom-up development initiatives – that is, both governments and CSOs – can meet in a

neutral and open environment, share ideas, learn from each other's successes and lessons, and establish networks for supportive communication within countries, across national borders or with countries in distant parts of the world. It operates internationally, as a global partnership that brings together a wide range of relevant stakeholders including UN organizations and international NGOs, and at the country level through National Alliances Against Hunger and Malnutrition, which for the most part are self-financed.

As food prices spiralled in 2007 and 2008, leading to riots in more than 30 poorer countries, FAO's Director-General was convinced that FAO's policy of media engagement and outreach was the right track. He scheduled first a High-Level Conference on Food Security in June 2008 and then, only 16 months later, another World Summit on Food Security.

### ■ High-Level Conference on Food Security – 2008

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The High-Level Conference took place in the midst of a dramatic world food crisis, attracted an outstanding turnout – more than 4,500 delegates from 181 countries, including 43 Heads of State and Government and 180 Ministers. But beyond that, the event achieved global reach through continuous, live satellite feeds, and was covered by 1 354 journalists, leading to almost 14 000 articles in the international media and hundreds of radio and television broadcasts. The net result – precisely that desired – was to put agriculture and food security back at the top of the international agenda. Some US\$12 billion was put on the table for the fight against hunger during and shortly before the meeting. FAO successfully communicated its main message to world leaders and international opinion: that the key to feeding the world today and tomorrow lies in increasing food production, particularly by small farmers in developing countries. This consensus was enshrined in the final Declaration, and the massive news coverage had an enormous ripple effect, with the world media giving great space and emphasis to the overall question of food security.

The conference resulted in a number of further initiatives, including the High-Level Meeting on Food Security for All, hosted by the Government of Spain in January 2009 and strongly supported by FAO; the establishment in April 2009 of a High-Level Task Force on the Global Food Security Crisis, chaired by the UN Secretary-General with FAO's Director-General as vice-chair; and the L'Aquila Food Security Conference, where G-8 leaders committed more than US\$20 billion over three years for sustainable agriculture.

### ■ World Summit on Food Security – 2009

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The message of the 2009 World Summit on Food Security – that agriculture and food security must remain at the very top of the current international agenda so long as hundreds of millions of people continue to suffer chronic hunger and malnutrition – was picked up readily by world leaders and the world media. There



## BOX 35

**High-Level Expert Forum on “How to Feed the World in 2050”**

A High-Level Expert Forum on “How to Feed the World in 2050” was held in Rome in October 2009. It examined long-term perspectives and policy options that governments should consider adopting to ensure that the world population can be fed when it nears its projected peak of 9.2 billion people in the middle of this century. For two days, more than 300 eminent experts from around the world reviewed and debated the investments, technologies and policy measures needed to secure the world’s food supplies. In addition to background issues briefs and synthesis papers, experts presented technical papers with the participation of audiences in moderated panel sessions – all Web-cast live. At the end of the conference, ten policy papers and a background document were incorporated into the documentation prepared for the World Summit on Food Security the following month.

is little doubt that the presence on the opening day of both Secretary-General Ban Ki-moon and Pope Benedict XVI was a big draw.

However, it was at this summit that Director-General Diouf became the personification of the message, beginning with a press conference on 11 November, at which he announced the *1billionhungry* campaign. Diouf also staged an overnight hunger strike in the unheated FAO lobby, viewed by many as the symbol of the summit. He gained further credibility when, at the close of the summit, he joined critics and expressed his disappointment with some aspects of the Final Declaration. In comments that made headlines around the world, he said “to my regret the official Declaration adopted by the summit this past Monday contains neither measurable targets nor specific deadlines which would have made it easier to monitor implementation.”

However, the Summit did result in four significant commitments, as underlined by the Director-General at the end of the meeting:

- a firm pledge to renew efforts to meet the target of the first MDG – halving the incidence of hunger by 2015 and eradicating hunger from the world at the earliest date;
- a pledge to improve international coordination and the governance of food security through a profound reform of the CFS, which would become a central component of the Global Partnership for Agriculture, Food Security and Nutrition;
- a promise to reverse the downward trend in domestic and international funding for agriculture, food security and rural development in developing countries and significantly increase their share in public development aid;
- a decision to promote new investments in agricultural production and productivity in developing countries in order to reduce poverty and achieve food security for all.

In the big picture, the broad dissemination of the summit's message about raising awareness of the problems of hunger and the grave lack of adequate support to the agriculture sector in the developing world – had been the aim of much of the Organization's work since the 1996 World Food Summit.

## Enhancing market information systems

In recent years, and notably since the 2007–2008 global food crisis, there has been an increasing interest in agricultural market information services. Accurate and timely information on food and agricultural market conditions are key for guiding informed decisions. Without the right information at the right time, proper decisions simply cannot be made. Better information also means less uncertainty.

Efficient market information provision can benefit farmers, traders, policy-makers and governments alike. Up-to-date information enables farmers to make informed decisions about what to grow, when to harvest, to which markets to sell the produce and whether or not to store products. It can also be used by government officials, planners and traders to monitor food availability, identify shortages and act accordingly. So it is clear that information plays a role in determining the behavioural dimensions of markets and, in the effort to improve the functioning of markets, the provision of accurate and timely information becomes a necessity.

Lack of reliable and up-to-date information on crop supply, utilization, stocks and export availability contributed to recent inappropriate policy decisions and higher price volatility. Better information on, and analysis of, global, regional and local markets and improved transparency could reduce the incidence and magnitude of wrong action price surges and thus limit the negative implications for food security.

### ■ Increased need for reliable market information

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In September 2010, the Extraordinary Intersessional Meeting of FAO's Intergovernmental Groups on Grains and on Rice highlighted the lack of reliable and up-to-date information on crop supply, demand and export availability as one of the root causes of sudden price hikes and volatility. As a remedy, the Groups proposed to enhance market information and transparency, recommending intensification of FAO's information gathering and dissemination at all levels.

With the increased globalization of agricultural markets, the liberalization of trade, and consequently greater integration of markets among countries and across sectors, the demands for information have grown tremendously. While there are numerous institutions, organizations and private firms engaged in the collection, analysis and dissemination of agricultural market information, perhaps the most important aspect of the activity is the need for obtaining regular, credible and centralized information, particularly in the public, free-access sector.

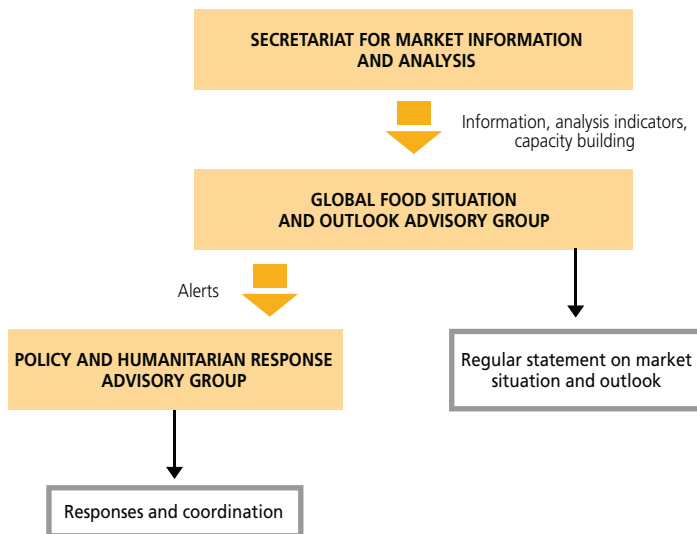
### FAO focus on early warning with GIEWS

Since its inception, FAO has sought to amass, synthesize, interpret, discuss and distribute market information. Activities underpinning its Global Information and Early Warning System (GIEWS) have built databases and published current and prospective information on crop shortages and emergencies and on market outlooks for basic food commodities (such as *Food Outlook*, *Crop Prospects and Food Situation* and the *Global Food Price Monitor*) to better inform the global community of emerging pressures, future trends and the underlying issues. Indeed, FAO's services in this area have been increasingly sought in recent years by government officials, specialists and the press, attempting to find explanations for the higher food price levels and volatility. Over the years, GIEWS has become a worldwide network including over 100 governments, more than 60 NGOs and numerous trade, research and media organizations. GIEWS has repeatedly demonstrated its capacity to alert the world to emerging food shortages. As early as September 2007, FAO was able to warn the international community about the looming global food crisis triggered by rising prices and to take early action by launching the Initiative on Soaring Food Prices (ISFP) by the end of the year.

In March 2009, GIEWS was complemented by the Food Price Data and Analysis Tool, as a platform allowing the study of different data series of prices in both nominal and real terms as well as comparisons of domestic and international price trends. An improved version of the tool was launched in April 2011, covering 78 countries and containing over 1 000 monthly domestic price series and 11 international cereal export price series, for a total of 20 different food commodity groups.

FIGURE 28

#### International mechanism for monitoring global agricultural commodity markets



Naturally, there are other institutions that provide food market information at the global level, including the United States Department of Agriculture (USDA), IFPRI and the International Grains Council. In addition to GIEWS, WFP's Vulnerability Analysis and Mapping (VAM) and USAID's Famine Early Warning System Network (FEWS NET) forecast food balances, assess food security and provide valuable information for countries facing food emergency situations.

For countries facing a serious food emergency, FAO and WFP carry out joint Crop and Food Security Assessment Missions (CFSAMs) to provide timely and precise situational information so that proper action can be taken by the governments, the international community and other concerned parties.

### **Information gaps remain**

Despite the increased awareness of the importance of timely and rigorous market information that enable both preparation for, and swift and effective response to, threats to food security, weaknesses and gaps still exist:

- Official country data on crop production and consumption forecasts often is not available to international information providers and even when available, forecasts often are not timely and can be inaccurate.
- Reliable official information on food stocks is not available for most of the main producing and consuming countries.
- No formal links exist between national market outlook agencies and international information providers.
- Market and food security indicators need to become more meaningful and comprehensive.
- Market outlook analysis scope should increase, to include developments in the energy and agricultural futures markets in price monitoring activities.
- Linkages with the private sector are often weak, especially as far as information on private stocks is concerned.
- Major food market players often have little capacity to collect and analyse information on expected production, stocks, trade flows and utilization.

The benefits of addressing and finding durable solutions to these deficiencies cannot be underestimated. Enhanced market information and early warning systems would enable both governments and the private sector to plan ahead. Governments would be able to assess needs more accurately, make budgetary provision for producer and consumer safety nets and better position emergency food security reserves. Better market information and analysis also could reduce uncertainties and assist producers, traders and consumers in making informed decisions, and thus contribute to improved food security.

Furthermore, the experience of the recent food price crisis and the current excess in price volatility in world food markets have exposed weaknesses in relation not only to the provision of market information but also to the coordination of policy responses. There is a critical need to ensure better preparedness and more rapid and consistent responses in times of crisis.

## ■ Proposal for Agricultural Market Information System

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It is in this context that in the framework of the current G20 work on price volatility that a new platform – the Agricultural Market Information System (AMIS) – is being proposed. The initiative builds on and complements existing systems with the aim of improving global market information reliability, timeliness and frequency as well as policy coordination through a collaborative effort among all relevant actors.

AMIS could be built on the model of the Joint Oil Data Initiative (JODI), which was launched in 2000 to improve information about oil markets. However, AMIS would have the additional function of issuing global food price surge alerts and promoting policy coherence. It would involve the major food-producing exporting and importing countries, and would be serviced by a joint secretariat consisting of international organizations with capacity to collect, analyse and disseminate information on a regular basis regarding the food situation and outlook, as well as food policies.

The structure of AMIS would consist of two groups: a Global Food Market Information Group responsible for market data collection and analysis, and a Rapid Response Forum tasked with the promotion of international policy coordination. Through the comprehensive coverage of global major food markets and the close monitoring of prices in combination with food security assessments across vulnerable countries, AMIS would also provide a mechanism for global early warning. This would increase the scope for more “automated systems” for evaluating food security implications of changing market situations whereby an indicator of different degrees of severity can be calculated routinely and where appropriate trigger an alert, and thus the need for action.

On the other hand, the AMIS Rapid Response Forum would provide policy advice and promote policy coordination when the market situation and outlook indicates a high food security risk. Through the participation of policy actors and specialists, the Forum would meet to evaluate the situation and, as required, mobilize the necessary political support to achieve agreement on appropriate policy response and actions in times of crisis. It would also need to work closely with the CFS to promote greater policy convergence and coherence and to strengthen policy linkages at the global level.

It should be noted, however, that while having access to good and timely information is necessary, it is not a sufficient condition for success. There is an equal need for having the capacity to use this information properly. That is why building capacity in the participating countries to collect and use market information would constitute an important component of the AMIS initiative. Efforts in this regard would focus on:

- a manual defining best practices and methodologies for agricultural market data collection and analysis, aiming at improving data quality and harmonization of the collection process across countries;
- a series of regional training sessions to enhance data collection capacity and to assist in the development of methodologies for food market assessment and outlook; and

- the identification, design and implementation of special projects, aiming at enhancing data collection and market outlook capacity at country level.

AMIS would also seek the active involvement of the private sector, as commercial enterprises could be important providers of data as well as data users. On the one hand, the private sector can assist significantly in improving the quality of food balance sheets through providing information, particularly on stocks. On the other hand, it can benefit from strong links with AMIS and the participating organizations by having regular access to timely information and also to specialized expertise. The increased transparency that comes from strengthening dialogue between the private sector, exporting and importing countries and international organizations can also serve to lend trust and increase confidence among the various actors.

## Strengthening global governance of food security and nutrition

Global food security and nutrition has deteriorated and continues to represent a serious threat to national and international peace and security. Of the 1 billion people, or 15 percent of the world's population, suffering from chronic hunger, about 150 million have joined the ranks of hungry people as a result of the effects of the food, fuel and financial (triple F) crisis. Yet hunger had in fact been on the rise since the mid-1990s, when food prices were low and economic growth was healthy. The presence of such high levels of hunger, malnutrition and poverty in the face of increasing global wealth and food abundance, and the inability to protect vulnerable people from the effects of crises point to a serious need for reform of the global food security governance.

Unless purposeful action is taken now, the future performance of the world agricultural system will not be sufficient to meet the increased demands for food, fibre and fuel. As shown, the need to feed 9.2 billion people in 2050, most of whom will be located in urban areas, will require an increase in agricultural production of 70 percent from the average of the 2005–2007 triennium. New challenges to global food security and nutrition in the form of increased demand for bioenergy and climate change are also likely to put added pressure on global food systems. Trends in public investment for agriculture in critical sectors such as research, extension, infrastructure and biodiversity are lagging seriously behind. It is obvious that a more coherent and effective response is required to address challenges of such magnitude at the global level.

### ■ Addressing the challenges

The world has faced food security crises in the past. The crisis of 1973–1974 led to the establishment of a number of international institutional arrangements under the auspices of the UN system to mobilize and focus efforts on eradicating hunger and food insecurity. The proposal to create the CFS was put forward at the 1974

## BOX 36

### Iniciativa América Latina y el Caribe sin Hambre

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The Hunger-Free Latin America and the Caribbean Initiative is a regional commitment to eradicate hunger and guarantee food security and nutrition for all, taking the fight against hunger one step further than the WFS and MDG targets. The Initiative was launched by the Governments of Brazil and Guatemala in 2005, and later endorsed by all countries at different regional gatherings, including the Latin America and the Caribbean Summit on Integration and Development and at FAO's Regional Conferences (in 2006, 2008 and 2010).

FAO supports the Hunger-Free Latin America and the Caribbean Initiative by working with governments to strengthen national and regional capacities to promote food security; to build and strengthen the institutional framework to guarantee the right to food; and to raise social awareness on the fight against hunger.

World Food Conference (UN, 1974) and it was established in 1975 by the FAO Conference (FAO, 1975) as an intergovernmental body to review and follow up policies concerning world food security and economic access to food. The CFS continued to carry out that mandate and, in 1996, following the World Food Summit, was given an additional task of monitoring implementation of the summit's Plan of Action.

A number of additional national and regional efforts have been developed to promote integration, coherence and consistency of national level efforts, such as African NEPAD/CAADP and the Hunger-Free Latin America and Caribbean initiative. The drive for greater coherence in policy and implementation was also evident in the efforts of donor countries through the Paris Declaration and the Accra Agenda for Action. The International Alliance Against Hunger was established after the World Food Summit: *five years later* as a multistakeholder mechanism to capitalize on experiences and reinforce initiatives at the national level.<sup>1</sup>

A flurry of activities at the global level followed the spike in international food prices in 2008. A number of conferences and meetings were held to discuss the causes of the crisis and measures to deal with the consequences, as well as to mobilize resources. The UN High-Level Task Force (HLTF) on the Global Food Security Crisis was established in April 2008 to promote a comprehensive and unified response by UN bodies through a prioritized, Comprehensive Framework for Action (UN, 2010d).

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<sup>1</sup> The name of the Alliance was changed to Alliance Against Hunger and Malnutrition (AAHM) in 2010, partially to better reflect the nutrition component: <http://www.theahm.org/home/en/>.

These initiatives resulted in some progress, such as increasing coherence among United Nations agencies and among groups of countries such as the G8. However, it remained evident that greater coherence in the global governance of food security was still needed to encourage convergence of policies and actions taken by all stakeholders – including governments, concerned national and international institutions, civil society groups, such as producer and consumer organizations, and other key players in the global food system. The role of the private sector should not be underestimated, particularly the food industry, which has large research and development capacity and extensive supply chains and market penetration. Working together, these stakeholders could contribute more effectively towards eliminating chronic hunger, food insecurity and malnutrition and preventing future food security crises from occurring.

It is precisely to achieve this that the challenge was taken up at the 2009 World Summit on Food Security where the participating heads of state and government, or their representatives, noted that:

*“A sense of urgency and a commitment to solving the global food crisis have served as catalysts for strengthening international coordination and governance for food security through the Global Partnership for Agriculture, Food Security and Nutrition, of which the Committee on World Food Security (CFS) is a central component.”*

(FAO, 2009n)

## ■ Reforming the CFS

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In order to achieve the aim of the 2009 Summit, CFS has undertaken a reform process. Its goal is to become a key inclusive international and intergovernmental platform where a broad range of committed stakeholders work together to support country-led processes aimed towards eliminating hunger and ensuring food security and nutrition for all.

With the reform, the more inclusive CFS can promote greater policy convergence and coordination through the development of international strategies and voluntary guidelines on food security and nutrition based on best practices, lessons learned from local experience, inputs received from the national and regional levels, and expert advice and opinions from different stakeholders. The CFS will also provide support or advice at the request of countries or regional organizations in the development, implementation, monitoring and evaluation of their nationally and regionally owned food security plans of action, the achievement of food security and the practical application of the Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security.

Considerable progress has been made in implementing CFS reform and in a subsequent phase, the CFS will take on additional roles to:

- serve as a platform to promote greater coordination and alignment of actions in the field, encourage more efficient use of resources and identify resource gaps, through building on the work of the HLTF and key partners, including national mechanisms and networks for food security and nutrition, UN



**PHOTO 27**

The complex nature of the underlying causes of food and nutrition insecurity requires a multilevel approach.



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country teams and other bodies such as the AAHM and its National Alliances, food security thematic groups, regional intergovernmental bodies and a large number of civil society networks and private-sector associations operating at the regional and national levels;

- actively monitor implementation of the 1996 WFS Plan of Action, by helping countries and regions to address the questions of whether objectives are being achieved and how food insecurity and malnutrition can be reduced more quickly and effectively, by identifying common indicators, success stories and lessons learned;
- develop a Global Strategic Framework for food security and nutrition in order to improve coordination and guide synchronized action by a wide range of stakeholders, building upon existing frameworks such as the CFA, the CAADP, and the Right to Food Guidelines.

The CFS aims to become more inclusive, open and effective through new structures, new working methods and various outreach initiatives. These include an expanded Bureau, composed of 12 members and an Independent Chair, as well as an Advisory Group, including representatives from United Nations organizations and bodies, CSOs and NGOs, international agricultural research bodies, international financing and trade institutions, and private-sector and philanthropic foundations. The CFS is supported by a High-Level Panel of Experts (HLPE) on food security and nutrition that has a steering committee comprising 15 world-class experts in the field. The HLPE contributes to CFS debates to enable decisions based on sound scientific advice. Support to the Plenary, Bureau, Advisory Group and HLPE has been expanded through a CFS secretariat located at FAO headquarters in Rome, which includes staff members from both WFP and IFAD.

In addition to the annual plenary sessions, a CFS intersessional process addresses specific issues, to develop the plenary agendas and implement plenary decisions. In order to realize the new vision and goal and ensure better coordination, CFS members agreed on three key guiding principles for the reform – inclusiveness, strong linkages to the field to ensure the process is based on on-the-ground reality,

and flexibility in implementation so that the CFS can respond to a changing external environment and membership needs.

### **A platform for global governance**

The success of the CFS in filling the gap in global governance of food security and nutrition depends on the extent to which all the relevant stakeholders can, or are willing to, contribute – not only to policy discussions and sharing of knowledge and experiences, but also to cooperate in abiding by their agreed priorities and to commit the resources necessary to implement the actions.

The complex nature of the underlying causes of food and nutrition insecurity requires a multilevel approach on multiple fronts. The depth and breadth of the steps that need to be taken to reduce and eliminate hunger indicate that some of the agreed targets are not likely to be met even by 2050. Even if all the necessary resources were available and the political will fully committed to achieve the targets now, it is not possible for the changes needed in economic, institutional, social and cultural processes to be made without a significant gestation period. The reality, unfortunately, is that the required resources are not available. Even when there have been agreements to commit a particular sum, delivery is too slow and meagre to make a significant dent in reducing the number of hungry. This means that actions have to be prioritized to make the greatest impact at the local level.

The reformed CFS can provide the platform for reaching a consensus on priorities and best practices and promote greater coordination and policy coherence. Effective food security and nutrition governance will require integration of what is agreed at the global level into national development priorities and strategies, including social protection programmes. Not only is coordination required among stakeholders that are now an integral part of the CFS, but also decisions need to be taken in the context of global and regional issues, such as climate change negotiations and trade agreements. The CFS will work to strengthen or establish links to relevant global and regional initiatives in areas related to its work. Regional and inter-regional arrangements are especially important, not only because they add value and support national efforts, but also because such cooperation provides a valid tool for sharing knowledge and best practices, as well as enhancing South-South Cooperation.

## **Conclusion**

The vision of eradicating hunger once and for all is vivid. The world has come a long way in the past two decades in terms of understanding who the hungry are, how many there are, and where they are located. We understand in much greater detail the reasons why hunger and malnutrition are so persistent. We know what needs to be done to combat hunger at the national, regional and global levels. We know how much we have to increase agricultural production and productivity. We have examples to study of what works and what does not work. We appreciate the

vital role of women and the critical importance of a gender-based approach to development. And yet, the numbers of chronically hungry people remain stubbornly, and shamefully, high.

The challenges of the decades to come, while the world's population continues to increase to more than nine billion, include not only dealing with the problems we know and understand, but also new problems whose effects we can only estimate. These new challenges include the impact of climate variability and change, which will vary in different regions and countries, and even within countries, and may increase the frequency and intensity of weather-related natural disasters. There are the changing patterns of food consumption to consider and the impact they will have on demand for certain types of foods. There is the impact of continuing globalization of trade. There will be new technologies to absorb. There will be the need to resolve the growing competition between crops for food and crops for energy.

At least the past decades have seen the issue of food security and feeding the world's hungry move up the international agenda. Two decades ago, before the World Food Summit, the concept of food security was not widely understood. Today a Google search instantly yields more than 37 million results: food security has hit the mainstream. The summits and high-level meetings of the past decades, many of them convened by FAO, have pushed that process forward. Instead of being an issue simply related to agricultural production, the preserve of FAO and the other Rome-based food agencies, it is increasingly understood that hunger is a political and economic issue of global dimensions. It has engaged countries at the United Nations and is addressed in the first of the MDGs.

The commitments have been made; the declarations signed; the goals set and agreed. But one thing has been lacking to translate the aspiration, the vision, into effective action on the two fundamental issues that must be resolved if hunger is to be ended: investment and markets. And that single element is, and always has been, political will. Both in developing countries and the developed world, political will is required to identify investment resources needed to build a rural infrastructure that will enable farmers to get their produce to market and reduce the appalling level of post-harvest losses. It is also needed to bring fairness and equity to markets, so that farmers in both developed and developing countries have the incentive of fair prices for their produce that will encourage them to invest in their farms and produce what the world needs today, and is going to need in the future.

For FAO in the years ahead, a focus on the two issues of markets and investment will surely top the list of priorities – even while it continues to engage in many other areas, supplying vital services to its members. In support of its focus on these priorities, it will need to intensify its efforts to communicate with and engage political leaders, multiple stakeholders and the general public at large, and to support efforts to improve the governance of world food security and nutrition, though coordination of policies, promoting convergence and coherence and spreading awareness of best practices.

The experience of the past two decades and the analyses that have been undertaken lead to the inescapable conclusion: there is a need for improved governance

of food security and nutrition that brings coordination and coherence to the fight against hunger; there is a need for governance of global markets; and there is a need for significant and sustained investment in the agriculture sector on the part of developing country governments, international financing institutions, and donors. But, above all, there is a need for the political will to solve the problem – political will that goes beyond signing up to the resounding declarations of intent, and translates into concrete and effective action on the ground.

To respond to the challenges, and to help member countries respond, FAO has radically transformed itself over the period. From being a technical agency operating in a degree of isolation, it has reached out to multiple stakeholders, recognizing that broad partnerships are needed if the vision is to be realized. FAO has engaged enthusiastically in advocacy for the cause of eradicating hunger, backing the moral arguments with sound scientific and economic evidence. It has also recognized the critical importance of sharing knowledge more effectively with the people who really need it – the poor farmers in developing countries.

Real and lasting change will be driven by stronger – and sustained – capacities for agricultural development and food security. These must be enhanced across every level of government, in all agriculture sectors, in civil society and in the private sector. FAO and its members have always known this and together have made important progress. Food security is now an issue firmly fixed on the international agenda, and the advocacy campaign must be sustained to make sure it stays there, that the hungry people of this world are not forgotten – at least until the shameful scourge of chronic hunger and malnutrition is finally consigned to history.



## ANNEX 1

# A view of FAO

## Strategic and functional objectives and regional representation

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### ■ Strategic objectives

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- Sustainable intensification of crop production
- Increased sustainable livestock production
- Sustainable management and use of fisheries and aquaculture resources
- Improved quality and safety of foods at all stages of the food chain
- Sustainable management of forests and trees
- Sustainable management of land, water and genetic resources and improved responses to global environmental challenges affecting food and agriculture
- Enabling environment for markets to improve livelihoods and rural development
- Improved food security and better nutrition
- Improved preparedness for, and effective response to, food and agricultural threats and emergencies
- Gender equity in access to resources, goods, services and decision-making in the rural areas
- Increased and more effective public and private investment in agriculture and rural development

### ■ Functional objectives

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- Effective collaboration with Member States and stakeholders
- Efficient and effective administration

**HEADQUARTERS****Rome, Italy****FAO REGIONAL AND SUBREGIONAL OFFICES****Africa**

Central Africa  
 Eastern Africa  
 North Africa  
 Southern Africa

**Accra, Ghana**

Libreville, Gabon  
 Addis Ababa, Ethiopia  
 Tunis, Tunisia  
 Harare, Zimbabwe

**West Africa****Accra, Ghana****Asia and the Pacific**

Pacific Islands

**Bangkok, Thailand**

Apia, Samoa

**Europe and Central Asia**

Central Asia  
 Central and Eastern Europe

**Budapest, Hungary**

Ankara, Turkey  
 Budapest, Hungary

**Latin America and the Caribbean**

Central America  
 Caribbean  
 Multidisciplinary team for South America

**Santiago, Chile**

Ancon, Panama  
 Bridgetown, Barbados  
 Santiago, Chile

**Near East**

Multidisciplinary Team for Oriental Near East  
 Gulf Cooperation Council States and Yemen

**Cairo, Egypt**

Cairo, Egypt  
 Abu Dhabi,  
 United Arab Emirates

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FAO's mandate is to assist its member countries and the international community in ensuring that all people have access to sufficient and safe and food. On a world scale, food production capacity is sufficient to satisfy this basic human right. Despite relentless efforts and comprehensive initiatives, the number of undernourished in the world has increased in the last half decade, peaking in 2009 to more than 1 billion – one in seven – people.

A decade into the 21st century, the world is facing a number of complex challenges, with serious implications for the state of global food security. The world's population is projected to reach 9 billion by 2050 and rural-urban migration is increasing considerably, with growth concentrated in today's developing countries. Globalization is affecting the agriculture sector and, together with economic expansion and urbanization, this is contributing to changing patterns in food consumption. Natural resources are being subject to unprecedented pressure from human activities, and marked climate and environmental changes are occurring, resulting in more frequent disasters and emergencies.

This book details current knowledge of these complex challenges and discusses likely implications for the food and agriculture sector and for hunger and poverty reduction efforts, including FAO's role in assisting its member countries in the coming years. Development practitioners, planners, decision-makers and all members of the international community with a genuine interest in hunger and poverty reduction will appreciate the book's broad and up-to-date coverage of global food security issues.

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