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CONFERENCE

Thirty-sixth Session

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OUTCOME OF THE HIGH LEVEL EXPERT FORUM ON “HOW TO FEED THE WORLD IN 2050” (Rome, 12 and 13 October 2009)

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I. INFORMATION NOTE ON THE HIGH-LEVEL EXPERT FORUM ON “HOW TO FEED THE WORLD IN 2050” (Rome, 12 and 13 October 2009)

1. The High-Level Expert Forum (originally designated High-Level Conference) on How to Feed the World in 2050, was approved by the FAO Conference in 2007. It was initially programmed for 2008, but subsequently rescheduled for 2009, thus giving more time for technical preparation. The Forum took place at FAO headquarters in Rome on 12 and 13 October 2009. It was preceded by a preparatory Expert Meeting held in Rome on 24-26 June 2009.
2. Background documentation prepared for the Forum included six 4-page Issues Briefs and a longer Synthesis Paper based on the outcomes of the June Expert Meeting and the sixteen commissioned technical papers prepared by experts attending that meeting and presented by them on that occasion. All the documentation was posted on the web site¹ dedicated to the Forum.
3. Invitations were sent to government officials, the academic world, civil society, farmers' groups and the private sector to attend in their personal capacities. Strenuous efforts were made to ensure appropriate geographic and gender balance among participants. Ambassadors and Permanent Representatives to FAO were also invited to the Forum.
4. A total of 382 invited participants registered for the event and a further 50 or so attended from Permanent Representations in Rome. Fifteen journalists from developing countries were sponsored to come to Rome for the event and a total of 45 media representatives were accredited.
5. Thanks to generous support from IFAD and the Government of Spain, it was possible to sponsor the travel of more than 100 participants from developing countries. Their active and enthusiastic participation greatly enlivened and enriched the debates.
6. The Forum was organized in a series of moderated panel discussions following an opening session which heard a statement from the Director-General and a keynote address by Professor Alain de Janvy of the University of California, Berkeley.
7. The full Forum programme was posted on the web site², listing presenters, moderators and panellists, all of whom made important contributions to the success of the event. The presenters also acted as rapporteurs for each of the panels.
8. Proceedings of the Forum were web-cast live, with the recording of each session archived for later viewing. The professional video coverage of the Forum was also used to prepare information packages for broadcasters. Background video footage was prepared in advance, including contributions from IFAD and WFP.³
9. The substantive outcomes of the discussions were incorporated into the documentation being prepared for the World Summit on Food Security (Rome, 16-18 November), namely ten Policy Papers and a Background Document. All these documents are hereto attached as annexes.
10. The Forum attracted substantial media coverage, both in the weeks before, when a series of press releases based on the Forum Issues Briefs were issued, as well as during and afterwards, when a number of analytical pieces appeared. FAO Officers gave a number of radio interviews in various languages.

¹ <http://www.fao.org/wsfs/forum2050/wsfs-forum/en/>

² <http://www.fao.org/wsfs/forum2050/wsfs-programme/hlef-programme/en/>

³ <http://www.fao.org/wsfs/forum2050/hlef-multimedia/hlef-photos/en/>;
<http://www.fao.org/wsfs/forum2050/hlef-webcast/en/>



Feeding the world in 2050



THE CHALLENGE

Agriculture in the 21st century faces multiple challenges: it has to produce more food, feed and fibre for a growing population with a smaller rural labour force, more feedstocks for a potentially huge bioenergy market, contribute to overall development in agriculture-dependent developing countries, adopt more efficient and sustainable production methods and adapt to climate change.

FOOD DEMAND AND PRODUCTION

World population is expected to grow by 2.3 billion people, between 2009 and 2050. Nearly all of this growth is forecast to take place in the developing countries. Among the latter group, sub-Saharan Africa's population would grow

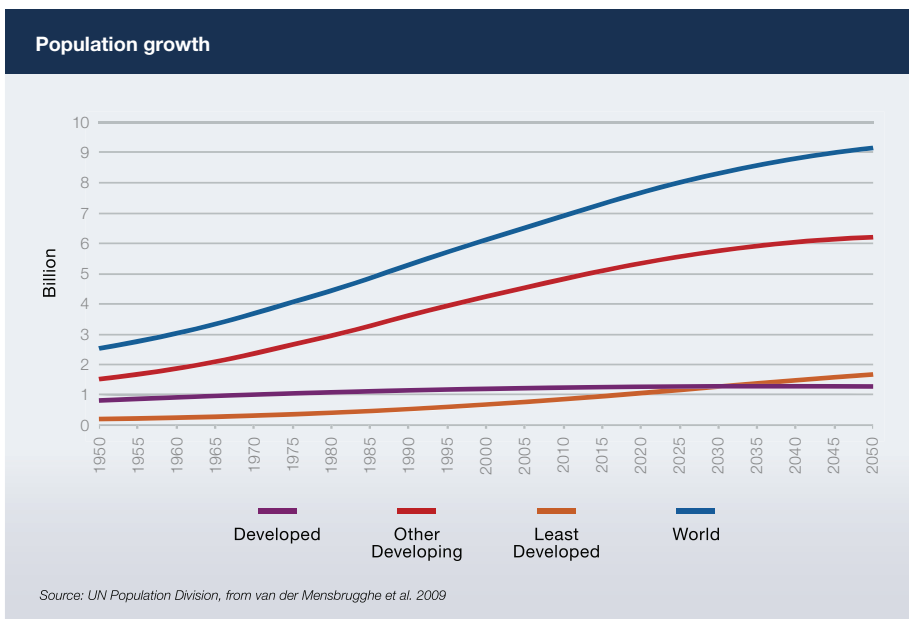
the fastest (+114 percent) and East and South East Asia's the slowest (+13 percent). Urbanization is foreseen to continue at an accelerating pace with urban areas to account for 70 percent of world population in 2050 (up from 49 percent at present) and rural population, after peaking sometime in the next decade, actually declining. 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. There is a general consensus that the recent trend whereby the economies of developing countries have been growing significantly faster than the developed ones is likely to continue in the future.

The projections show that feeding a world population of 9.1 billion people

in 2050 would require raising overall food production by some 70 percent between 2005/07 and 2050. Production in the developing countries would need to almost double.

These trends mean that market demand for food and feed would continue to grow. Demand for cereals, for both food and animal feed is projected to reach some 3 billion tonnes by 2050, up from today's nearly 2.1 billion tonnes. The advent of liquid biofuels has the potential to change some of the projected trends and cause world demand to be higher, depending mainly on energy prices and government policies. The demand for other food products that are more responsive to higher incomes in the developing countries (such as meat and dairy products, fish and aquaculture products, vegetable oils) will grow much faster than that for cereals for food use. Livestock, which already constitutes 30 percent of agricultural GDP in the developing world, is one of the fastest-growing sub-sectors in agriculture.

The expected increasing 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 Asia and the Pacific region, especially in China and



also in Latin America, led by Brazil, and is expected to outpace growth in OECD countries by a factor of 2:1 in the next decade. Renewed investment, capacity building, improved infrastructures and the introduction of modernised, intensive and integrated production technologies are the main factors spurring higher growth in these countries. This is especially true for poultry in China, Brazil and India, and to some extent in the Commonwealth of Independent States (CIS) countries. Livestock also provides traction for about half of the world's farmers and is a source of organic fertilizer for most of the world's crop lands.

INTERNATIONAL TRADE

Trade in agricultural commodities is also expected to expand considerably. For example, net cereal imports into the developing countries would increase almost three-fold to reach nearly 300 million tonnes by 2050 and, by then, would account for some 14 percent of their cereal consumption, up from 9.2 percent in 2006/08. Cereals self-sufficiency would continue to be low in the region most dependent on food imports

(i.e. in the Near East/North Africa). At the other extreme, Latin America and the 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 to 95 percent range compared with 83 to 100 percent at present.

NATURAL RESOURCES

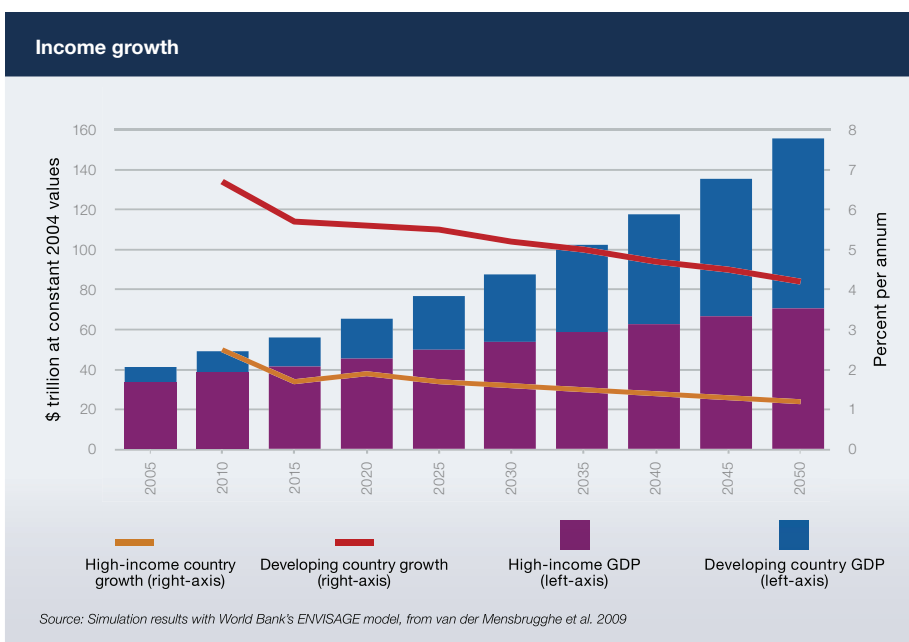
Ninety percent of the growth in crop production globally (80 percent in developing countries) is expected to come from higher yields and increased cropping intensity, such as two crops per year, with the remainder coming from land expansion. Arable land would expand by some 70 million ha (or less than 5 percent), with the expansion in developing countries by about 120 million ha (or 12 percent) being offset by a decline of some 50 million ha (or 8 percent) in the developed countries. Almost all of the land expansion in developing countries would take place in sub-Saharan Africa and Latin America. In CIS countries, the potential for expansion of arable land is 15 million ha.

Land equipped for irrigation would expand by some 32 million ha (11 percent), while harvested irrigated land would expand by 17 percent. All of this increase would be in the developing countries. Due to a slowly improving efficiency in water use and a decline in the area under rice, water withdrawals for irrigation would grow at a slower pace but still increase by almost 11 percent (or some 286 cubic km) by 2050. The pressure on renewable water resources from irrigation would remain severe and could even increase slightly in several countries in the Near East/North Africa and South Asia.

Crop yields would continue to grow but at a slower rate than in the past. This process of decelerating growth has already been under way for some time. On average, annual crop yield growth rate over the projection period would be about half of its historical growth rate.

ARE THE PROJECTED INCREASES IN LAND, WATER USE AND YIELDS FEASIBLE?

The Global Agro-Ecological Zone study shows that there are still ample land resources with potential for crop production available, but 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, but many countries with growing rural populations in these regions are extremely land-scarce, and much of the potential land is suitable for growing only a few crops that are not necessarily those for which there is the highest demand. Also much of the land not yet in use suffers from constraints (chemical, physical, endemic diseases, lack of infrastructure, etc.) that cannot easily be overcome or has important environmental characteristics.

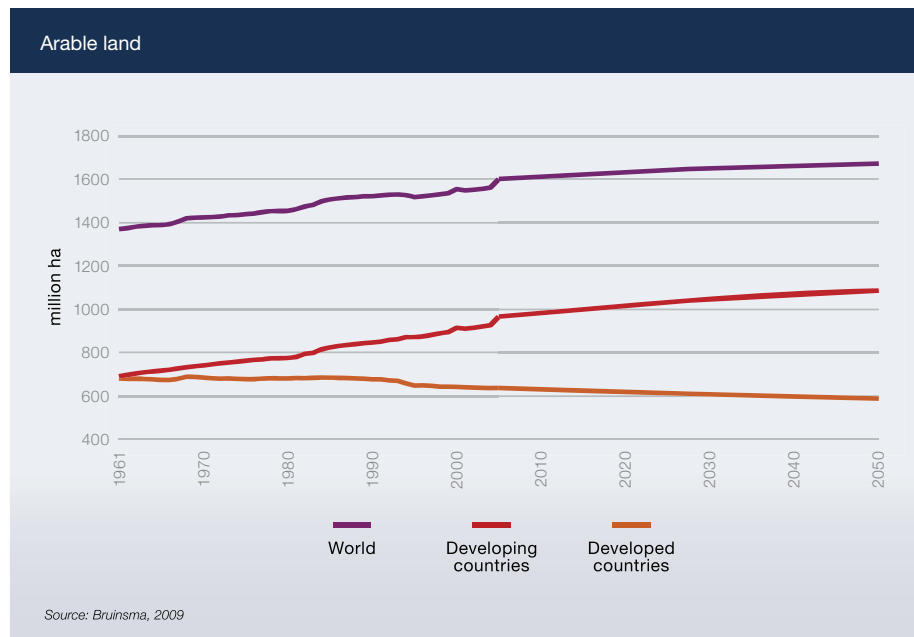


The availability of fresh water resources shows a similar picture as land availability, i.e. globally more than sufficient but very unevenly distributed, with an increasing number of countries or regions within countries reaching alarming levels of water scarcity. This is often the case in the same countries in the Near East/North Africa and South Asia that have no land resources left. A mitigating factor could be the fact that there are still ample opportunities to increase water use efficiency.

The potential to raise crop yields even with the existing technologies seems considerable. Provided the appropriate socio-economic incentives are in place, there are still ample 'bridgeable' gaps in yield (i.e. the difference between agro-ecologically attainable and actual yields) that could be exploited. Similarly there is considerable scope for narrowing performance gaps in the livestock production. Aquaculture, the fastest growing food production system (7 percent annually) offers new opportunities with comparatively less use of freshwater if well managed.

ACCESS TO FOOD

The projected global economic growth of about 2.9 percent annually would lead to a significant reduction or even near elimination of absolute "economic" poverty in the developing countries (persons living on less than USD1.25/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: the USD1.25/day poverty line is simply too low. On less stringent criteria, deprivation and undernutrition would remain widespread, though significantly less than today.



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 to food by the needy and vulnerable is significantly improved. Otherwise, while the prevalence of chronic undernourishment in developing countries could fall from 16.3 percent (823 million) in 2003/05 to 4.8 percent in 2050, this would still mean that some 370 million persons would be undernourished in 2050. Of the three developing regions with the highest numbers of undernourished people currently, declines would be most pronounced in Asia (both East and South Asia), but less so in sub-Saharan Africa. On these prospects, the World Food Summit target of halving the numbers of hungry people by 2015 (from the 813 million of 1990/92) may not be reached until well into the 2040s. These calculations underline the importance and urgency of putting in place effective poverty reduction strategies, food and nutrition security initiatives, safety nets, and rural development policies and programmes focussed on increasing

smallholder agriculture production and productivity in developing countries. One major cause of the persistence of hunger is the fact that the food is not produced in the countries where 70 percent of the world's poor live.

HUNGER AND POVERTY REDUCTION AS ECONOMIES TRANSFORM

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 analysis shows that GDP growth originating in agriculture is, on average, at least twice as effective in benefiting the poorest of a country's population as growth generated in non-agricultural sectors. This is not surprising as 75 percent of the poor in developing countries live in rural areas and derive significant parts of their livelihoods from agriculture and related activities. For agriculture-dependent countries in particular, agricultural growth is key for overall growth and development and for poverty reduction.

A vibrant agricultural sector has been the basis for a successful economic transformation in many developed countries. It was the precursor to the industrial revolutions in Europe and the USA and more recently to those in China, Republic of Korea, Thailand, Viet Nam and other rapidly growing Asian economies. During these transformations, investment in agriculture and in 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 in those countries has been a transition from many, small subsistence producers to fewer and larger commercial farmers, more non-farm employment and larger farm operations overall. The outlook to 2050 suggests that many developing countries would be on the pathway to such transformation.

While the role of agriculture as a driver of overall growth would diminish over time along with its share in GDP, the experience of today's middle income countries suggests that its role in poverty and hunger reduction would continue to be significant. Agriculture's contribution to hunger reduction consists not just in producing food where needs are most pronounced, but also in creating employment, generating income and supporting rural livelihoods.

POLICY CONSIDERATIONS ARISING FROM THE FAO HIGH-LEVEL EXPERT FORUM ON HOW TO FEED THE WORLD IN 2050 (ROME, 12-13 OCTOBER 2009)

- ▶ There was consensus that the technical ability to produce enough food globally to feed the world in 2050 does not necessarily mean that the world will be free from hunger. Hunger is a poverty problem. It is a manifestation of a lack of access to food, not or not necessarily a question of food production.
- ▶ However, agriculture can help address the poverty problem. 75 percent of the poor live in rural areas and many of them depend on agriculture for their livelihoods. Making agriculture more productive and profitable can be an important element in the fight against hunger. This requires more investments in agriculture and rural areas in developing countries.
- ▶ There was also general consensus that agriculture alone will not be sufficient to put an end to hunger. Investments in agriculture need to be broader and investments should aim to promote income generating activities for the poor and thus improve their ability to purchase food. It was felt that a future food security approach has to be broader and go beyond primary agriculture. For economic growth to be sustainable in the long-run, investments in agriculture have to be accompanied by investments in infrastructure, institutions and ultimately in the manufacturing and service sectors.

- ▶ There was consensus that future agricultural price variability will increase. More variability, greater uncertainty and higher risks were seen as important issues that affect the poor and could potentially hold back development in the long-run. Shocks can come from numerous areas. These include higher weather variability and climate change, less interest to hold stocks, more speculation, greater transmission of price signals from other more volatile commodity markets, particularly from the energy market. The conclusion was that agriculture has to be made more resilient to exogenous shocks and that better risk management options and policies need to be developed.
- ▶ Future development and hunger reduction strategies also have to be tailored to country and context specific problems. For some countries, particularly those with limited agricultural resources, high population growth rates and limited non-agricultural development possibilities, special efforts will be required.

For further information



World Summit on Food Security
Rome 16–18 November 2009

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Food security and the financial crisis



IMPLICATIONS FOR LIVELIHOODS AND FOOD SECURITY

The global financial and economic crisis has pushed an additional 100 million people into hunger in 2009, bringing the overall number of undernourished people in the world to over one billion. The crisis has threatened livelihoods and access to food for those who have lost jobs and incomes including from remittances, as well as for other family members who must now provide support.

Developing countries have seen their export markets contract, and investments and other capital inflows, including development aid, are also at risk. In the agricultural sector prices for seeds and fertilizers (and other inputs) have more than doubled since 2006. Poor farmers with limited access to agricultural credit and markets could not take advantage of higher commodity prices, and found it difficult to deal with the situation without support.

This drastic development has aggravated global food insecurity and threatens the achievement of the Millennium Development Goals (MDGs), in particular the MDG1 target of reducing the prevalence of hunger by half by 2015. The proportion of hungry people in developing countries fell from 18 percent in 1995-97 to 16 percent in 2004-06, but has risen to 19 percent in 2009. This increase underlines the urgency

of tackling the root causes of hunger swiftly and effectively.

The current global economic slowdown – following the soaring food price episode of 2007–2008 – lies at the core of the sharp increase in world hunger. It has reduced incomes and employment opportunities of the poor and significantly lowered their access to food. With lower incomes, the poor are less able to acquire food, especially as prices are still high by historical standards. While international food prices have retreated from their mid-2008 peak levels, prices on local markets have not fallen to the same extent in many developing countries. In September 2009, domestic staple foods in developing countries cost on average 20 percent more in real terms than two years earlier.

Apart from humanitarian concerns, hunger directly threatens development. Faced with food insecurity, households try to maintain income by adopting negative coping strategies, such as selling of productive assets, becoming trapped in debt, withdrawing children from school, engaging in illegal activities and child labor, forced migration and, at worst, permanent destitution and fuelling of conflict. Furthermore, when food prices rise or incomes decline, people tend to reduce expenditures on basic health care and protein- and nutrient-rich foods such as meat, dairy products, or fruits and vegetables.

CRISIS RESPONSE

It is widely recognized that significant additional investment in agriculture is required to eliminate poverty and achieve food security in developing countries. FAO estimates that gross investments averaging USD 209 billion per year are required in primary agriculture and downstream services (such as storage and marketing facilities) to meet food demand in 2050, i.e. an increase of almost 50 percent over current levels. Additional public investments are required in agricultural research, infrastructure and safety nets. Even if the aggregate amount needed is forthcoming, however, it will still be necessary to address in a timely and appropriate manner another very important issue that is often overlooked: the specific needs of smallholder farmers. The structural solution to combat hunger and poverty lies in increasing production and productivity in developing countries, particularly by small farmers.

Well established early warning systems and emergency funding mechanisms exist for humanitarian crises; the UN Central Emergency Response Fund (CERF) has proven effective in this regard. Humanitarian funding mechanisms, however, are not designed to avert and mitigate agricultural impacts of crises caused by economic shocks and do not provide sufficiently for “building back better”, while existing sources and mechanisms for investment in

agriculture are too slow to react to crises that undermine food security.

The lack of access of smallholders to appropriate resources and indispensable inputs to safeguard their productive capacity during a crisis is also due to the practice of earmarking overseas development assistance for sectoral interventions that often pay insufficient attention to the holistic needs of small holder farmers. Also, inadequate scale and late arrival of emergency funds make it difficult to control outbreaks of crop and livestock pests and diseases, even though the cost of control is usually much less than the economic losses caused by uncontrolled outbreaks.

To address those challenges, the international community has endorsed a comprehensive approach for improving food security covering all dimensions: availability, stability, access and utilization. Under this approach, public investment for productivity and resilience enhancement measures is a key component of crisis response. For example, investment in landslide protection, water-harvesting-based terracing and trenching of unstable slopes, participatory forestry and agro-

forestry, degraded land restoration, skills building and soil fertility enhancement are integral components of productivity safety nets and sustainable livelihood strategies in shock-prone countries with large portions of degraded lands.

What is needed are better coordinated and faster crisis response mechanisms that address all dimensions of food security.

IFI INITIATIVES

The World Bank has been making emergency recovery loans since 1989, disbursing USD 11.4 billion, but processing them often took up to 12 months. In 2007 a new framework was introduced for providing fast track loans with a maximum processing time of 3 months. The 3-year Global Food Crisis Response Programme (GFRP) was set up within this framework in May 2008, with USD 2 billion. It provides fasttrack loans to address both immediate and developmental needs of countries hard hit by high food prices. Technical and financial assistance (USD 83 million), provided by the Global Facility for Disaster Reduction and Recovery to help disaster-prone countries decrease their vulnerability

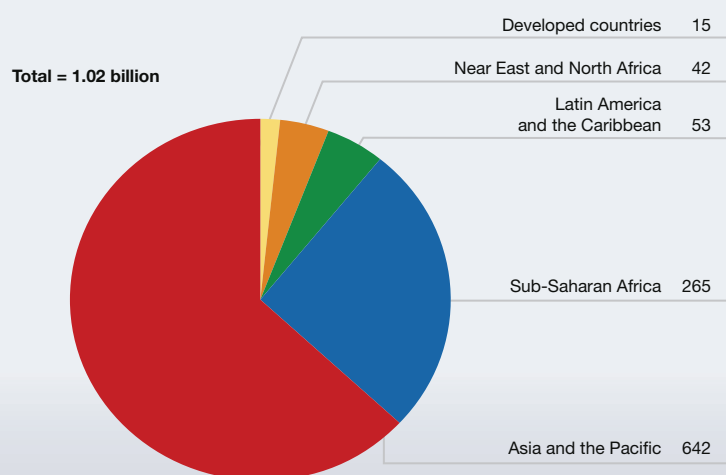
and adapt to climate change, also qualifies for the fasttrack procedure.

Created in 2008, the Catastrophe Risk Deferred Drawdown Option (CAT DDO) offers fast-tracked bridging loans to countries that suffer a natural disaster and declare a state of emergency, up to USD 500 million for each country. The Global Programme for Avian Influenza Control and Human Pandemic Preparedness and Response (GPAI), a fast-track loan programme of the World Bank of USD 1 billion, and the Avian and Human Influenza Facility (AHIF), a multidonor grant programme administered by the World Bank of USD 126 million, help client countries deal with epidemics caused by viruses in birds and livestock, and prepare for and respond to a possible human flu pandemic.

In April 2008, the International Fund for Agriculture Development (IFAD), made available up to USD 200 million from existing loans and grants to provide an immediate boost to agricultural production in the developing world in the face of high food prices and low food stocks. This provision was designed to be distinct from emergency relief, food aid or social safety nets, but to accompany such aid provided by other partners. Measures were taken by the Fund to fast track these allocations.

Other major IFIs have also been approving major financial allocations to address the immediate needs of countries affected by the food crisis such as the Inter-American Development Bank, which approved a credit line of USD 500 millions in September 2008, the African Development Bank (ADB) which committed USD 1 billion in May 2008, the Asian Development Bank, which allocated USD 500 million in July 2008 and the Islamic Development Bank (ISDB), which committed USD 1.5 billion over the next 5 years.

Figure 1: Undernourishment in 2009, by region (millions)



Source: FAO

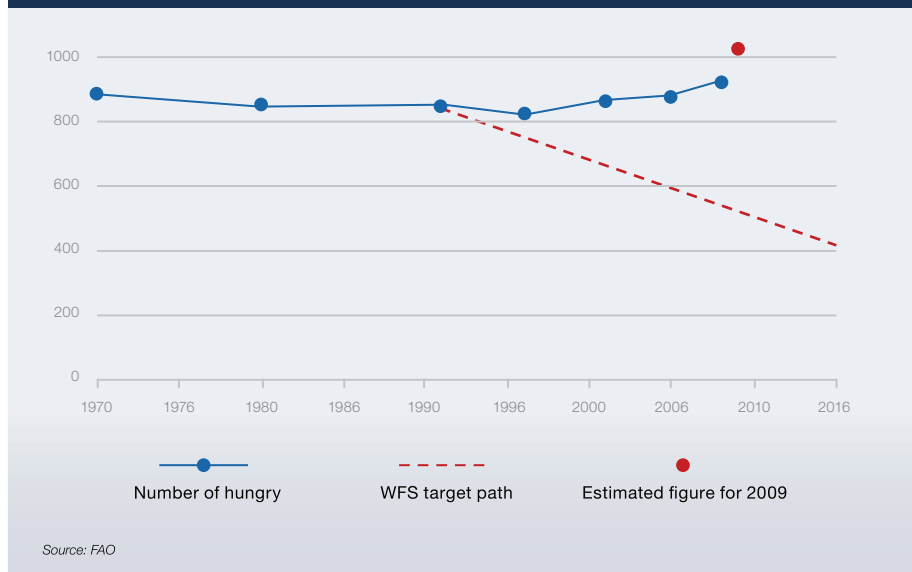
PRESERVING SMALLHOLDER PRODUCTIVITY

Commercial farmers in developed countries have the options of insuring their productive assets and their crops against theft, fire and weather-related losses, and of using commodity markets to hedge against price risks. Weather insurance and commodity exchanges are two mechanisms that are being piloted in a number of developing countries, although it is still soon to judge their efficacy.

The UN Central Emergency Response Fund (CERF) is a tool created by the United Nations to preposition funding for humanitarian action. It was established in 2005 to upgrade the prior Central Emergency Revolving Fund by including a grant element based on voluntary contributions by governments and private sector organizations. The grant component has two windows, one for rapid response and one for underfunded emergencies. The grant component aims at mobilizing USD 450 million on a yearly basis, of which two thirds for the rapid response window and one third for the “forgotten emergencies”. The United Nations and its specialized agencies, funds and programmes as well as the International Organization for Migration (IOM) are eligible for both grants and loans.

In December 2007, FAO launched the Initiative on Soaring Food Prices (ISFP) in an effort to help the most affected countries deal with the situation. ISFP's main objective is to facilitate access of farmers to inputs (seeds, fertilizers, animal feed, etc.) primarily in low-income food-deficit countries. Through a consultative process at country level, involving needs assessment missions, the ISFP identified short-term interventions to address price rises and economic cutbacks, and has mobilized close to USD 400 million in response funding including from its own resources and trust fund voluntary

Figure 2: Number of hungry people in the world (in millions)



contributions (e.g. the EU Food Facility).

The World Food Programme (WFP) scaled up its activities in 2008 to meet the urgent requests of nations hit by soaring food prices, food scarcity and food riots, reaching over 100 million people, and mobilizing over USD 5.1 billion. Activities included expansion of school feeding programmes, the provision of supplementary rations of nutritious food, expansion of safety net programmes to protect livelihoods, provision of food assistance in urban and peri-urban areas, expanded voucher programmes and cash transfers to increase market access to food and provision of targeted food rations to vulnerable groups. In addition, WFP is also increasingly purchasing locally produced food for its operations and school feeding programmes (the Purchase for Progress initiative).

The High Level Task Force on the Global Food Security Crisis (HLTF) was established in April 2008 by the UN Secretary General Ban Ki-Moon in response to the food price crisis. It is co-chaired by the Director-General of FAO and is composed of the heads of UN agencies, funds and programmes

and Bretton Woods institutions. The primary aim of the HLTF is to promote a comprehensive and unified response to the challenge of achieving global food security. The HLTF prepared the Comprehensive Framework for Action (CFA) to focus attention on meeting the immediate needs of vulnerable populations while simultaneously promoting support for building resilience and contributing to global food and nutrition security in the longer term.

EUROPEAN UNION FOOD FACILITY

In 2008 the European Union (EU) established an EUR 1 billion Food Facility whose objective is to finance measures aimed at supporting a rapid and direct response to volatile food prices in developing countries, addressing primarily the period between emergency aid and medium- to long-term development cooperation. The Facility focuses on programmes that will have a quick, but lasting impact on food security. Through an innovative coordinating mechanism, UN agencies and the World Bank cooperated to assess country needs and identify areas of comparative organizational strength. From 2008 until 2011, activities under the Facility will centre on improving farmers'

access to quality inputs and services, boosting production, and providing safety nets to vulnerable groups.

RENEWING GLOBAL GOVERNANCE

Recently, there has been growing interest in redesigning global governance of world food security and calls have been made for a Global Partnership for Agriculture, Food Security and Nutrition. The renewed global governance system should build on and reform existing institutions to better address the long term, structural factors that cause hunger and malnutrition, as well as to respond more effectively to crises affecting agriculture and food security. The idea is to realign and improve coordination among existing institutions and mechanisms so they can meet current and emerging challenges in a more effective way.

In this perspective, members of the Committee on World Food Security (CFS) agreed at their 35th Session (Rome, 14-17 October 2009) on a wide-ranging reform of the Committee, aiming to make CFS the foremost inclusive international and intergovernmental platform dealing with food security and nutrition and enable it to be the basis for the Global Partnership.

The CFS reforms are designed to focus the Committee's vision and role to better serve as a forum for policy debate and convergence, and to facilitate appropriate action on food security and nutrition

among governments, representatives of UN agencies and other inter-governmental organizations, and civil society. This includes supporting national anti-hunger plans and initiatives; ensuring that all relevant voices are heard; and strengthening linkages at regional, national and local levels. The CFS will also be supported by a High Level Panel of Experts (HLPE) that will serve as a multi-disciplinary scientific advisory body to provide scientific evidence and state of the art knowledge on which to base decisions.

POLICY CONSIDERATIONS

- ▶ What have we learned from the characteristics of the current financial and economic crisis about risks to food security that developing countries may face in the medium-term?
- ▶ What have been the most serious deficiencies in the existing response mechanisms?
- ▶ What adjustments to existing response mechanisms would allow more timely and adequate response?
- ▶ What is or could be the most appropriate mechanism to streamline and coordinate reaction to aspects of future food security crises that threaten to reduce smallholder productivity?

For further information



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Foreign direct investment – win-win or land grab?



THE CHALLENGE

The recent surge of interest in foreign investment in agricultural land has aroused substantial international concern. Certainly, complex and controversial economic, political, institutional, legal and ethical issues are raised in relation to property rights, food security, poverty reduction, rural development, technology and access to land and water. On the other hand, lack of investment in agriculture over decades has meant continuing low productivity and stagnant production in many developing countries. Lack of investment has been identified as an underlying cause of the recent food crisis and the difficulties developing countries encountered in dealing with it. FAO estimates that gross annual investments of USD 209 billion are needed in primary agriculture and downstream services in developing countries (this in addition to public investment needs in research, infrastructure and safety nets) to meet global food needs in 2050. Developing countries' own capacity to fill that gap is limited. The share of public spending on agriculture in developing countries has fallen to around 7 percent, even less in Africa, and the share of official development assistance going to agriculture has fallen to as little as 3.8 percent in 2006. Commercial bank lending going to agriculture in developing countries is also small – less than 10 percent in sub-Saharan Africa and microfinance loans, while indispensable, have not proved sufficient to agricultural investment needs. Private

investment funds targeting particularly African agriculture are an interesting recent development but actual investments are still small. Given the limitations of alternative sources of investment finance, foreign direct investment in developing country agriculture could make a contribution to bridging the investment gap and realizing the hunger and poverty eradication goals. The question therefore is not whether foreign direct investment should contribute to meeting investment needs but how its impact can be optimized to maximize the benefits and to minimize the inherent risks for all involved. To answer that question we need to understand what is happening in foreign investment and why.

WHAT DO WE KNOW ABOUT RECENT FOREIGN INVESTMENTS IN DEVELOPING COUNTRY AGRICULTURE?

Unfortunately, there are no detailed data on the extent, nature and impacts of these investments: international investment statistics are too aggregated and little is divulged by those involved in specific cases. Much information is anecdotal, probably exaggerated and difficult to verify. However, from what limited information is available, a number of observations can be made:

- ▶ Foreign direct investment (FDI) in developing country agriculture does appear to have increased in the last two years, although the number of projects actually implemented is less than the number being planned or reported in the

media. Inward FDI stock in agriculture in 2007 stood at some USD 32 billion, four times higher than in 1990.

- ▶ The inflow of FDI into agriculture amounted to more than USD 3 billion per year by 2007, compared to USD 1 billion in 2000. If food and beverages are included, the flow rises to USD 7 billion in 2007.
- ▶ The main form of recent investments is purchase or long-term leasing of agricultural land for food production. The area of land acquired in Africa by foreign interests in the last three years is estimated at up to 20 million hectares.
- ▶ The major current investors are the Gulf States but also China and South Korea. The main targets for recent investment are countries in Africa but there are also investments in Southeast Asia and South America.
- ▶ Investors are primarily private sector but governments and sovereign wealth funds are also involved in providing finance and other support to private investors or directly.
- ▶ Private sector investors are often investment or holding companies rather than agro-food specialists, which means that necessary expertise for managing complex large-scale agricultural investments needs to be acquired.
- ▶ In host countries it is governments who are engaged in negotiating investment deals.

► Current investments differ from the recent pattern of foreign direct investment in several 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; they involve acquisition of land and actual production rather than looser forms of joint venture.

KEY ISSUES

WHY FOREIGN INVESTMENT?

A major underlying driver of the recent upturn in investments, which perhaps differentiates it from the normal run of foreign investments, is food security. This reflects a fear arising from the recent high food prices and policy-induced supply shocks, notably the result of export controls, that dependence on world markets for food supplies has become questionable. For those countries facing worsening land and water constraints

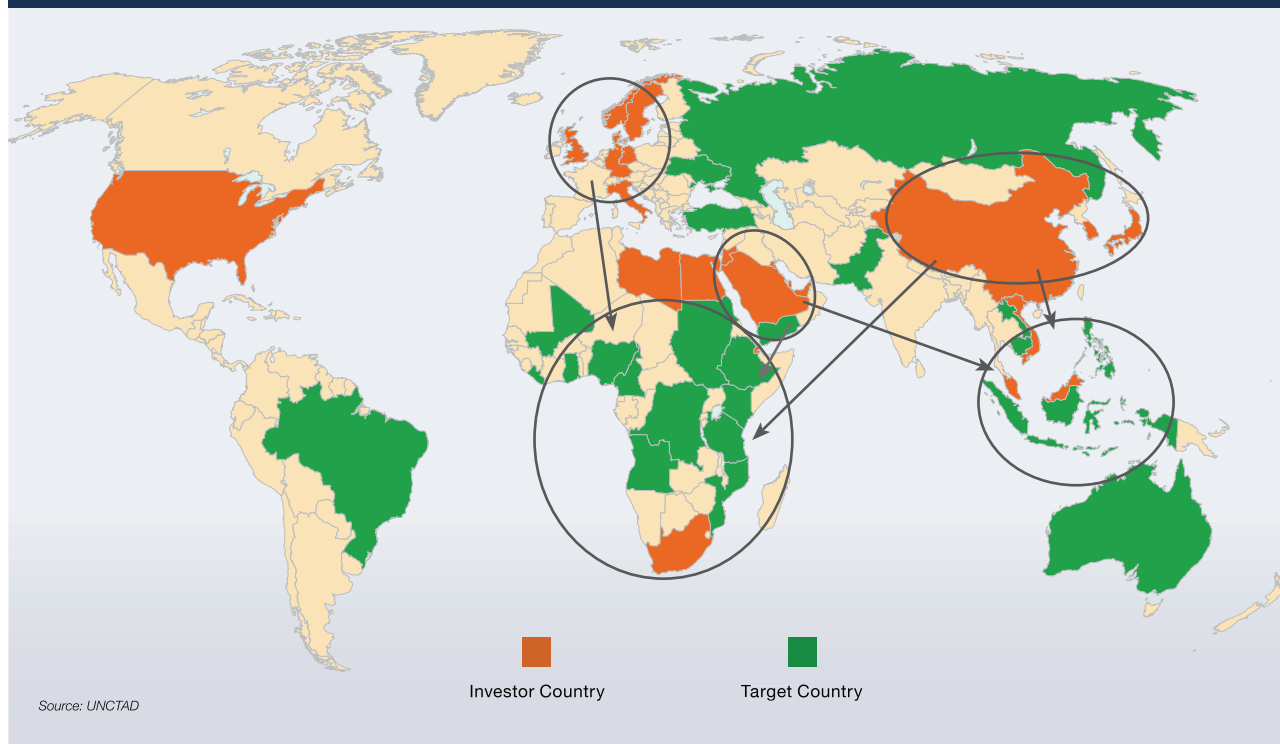
but with increasing populations, incomes and urbanization, and hence increasingly dependent on imported food, these fears provoked a serious reassessment of their food security strategies. Investing in producing food in countries where the land, water and labour constraints faced domestically are not present is seen as one viable strategic response. This offered investment opportunities to the private sector that governments have been willing to support. Some developing countries are making strenuous efforts to attract and facilitate foreign investment into their agricultural sectors. For them, foreign direct investment is seen as a potentially important contributor to filling the investment gap and stimulating domestic economic growth. However, how far these investments go towards meeting their real investments needs is uncertain. The financial benefits to host countries of asset transfers appear to be small, but foreign investments are seen as potentially providing developmental benefits through, for example, technology transfer,

employment creation, income generation and infrastructural developments. Whether these potential developmental benefits will actually be realized is a key concern.

THE “LAND GRAB”

The much-publicised “land grab” involving the purchase or leasing of agricultural land in developing countries for food production is just one form of investment and one which arguably is least likely to deliver significant developmental benefits to the host country. Some countries are seeking foreign investments to exploit “surplus” land currently unused or underutilized. One reason land may not be used to its full potential is that the infrastructural investments needed to bring it into production are so significant as to be beyond the budgetary resources of the country. International investments might bring much needed infrastructural investments from which all can benefit. However, selling, leasing or providing concessional access to land raises the questions of how the land concerned was

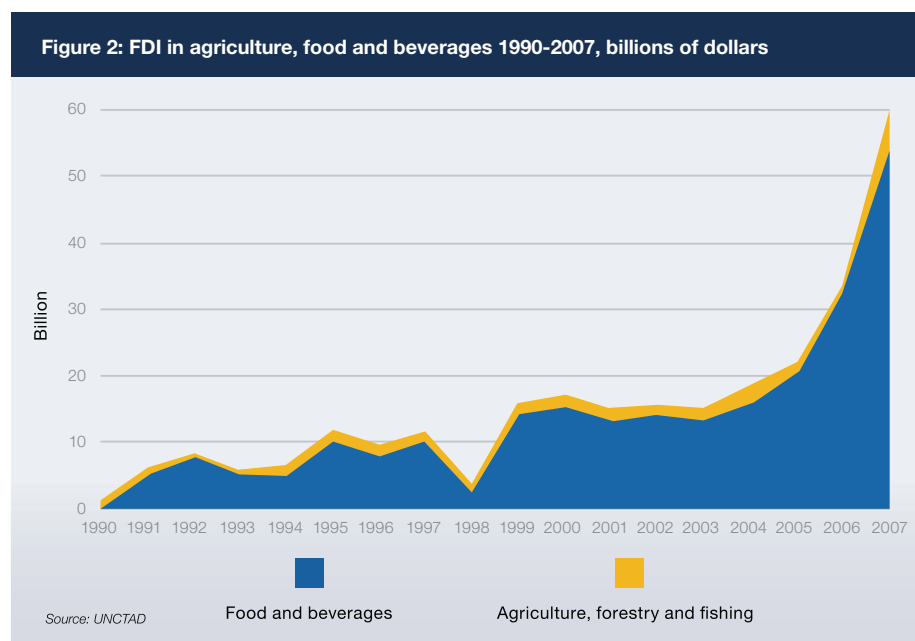
Figure 1: Investor and target regions/countries in land investment for agriculture, 2006-2009



previously being utilized, by whom and on what tenurial basis. In many cases, the situation is unclear due to ill-defined property rights, with informal land rights based on tradition and local culture. While much land in sub-Saharan Africa may currently not be utilized to its full potential, apparently “surplus” land overall does not mean land is unused, unoccupied or unclaimed. Its exploitation under new investments involves reconciling different claims. Change of use and access may involve potentially negative effects on local food security and raise complex economic, social and cultural issues. Such difficulties at least demand consultation with those with traditional rights to land, and favour alternative mutual arrangements for investments.

ALTERNATIVES TO LAND ACQUISITION

It is also not clear that land acquisition is necessary or desirable even for investors. Acquisition of land does not necessarily provide immunity to sovereign risk and can provoke political, social and economic conflicts. Other forms of investment such as contract farming and outgrower schemes can offer just as much security of supply. It is interesting to note that in other contexts, vertical coordination tends to be based much more on such non-equity arrangements than on the traditional acquisition of upstream or downstream stages. The development of East African horticultural production for export by European supermarket chains is a case in point. Such looser arrangements may be more conducive to the interests of the receiving country. However, even here there are likely to be questions as to the compatibility of the needs of investors with smallholder agriculture, and this in turn raises questions about poverty reduction potential. Nevertheless, joint ventures might offer more spillover benefits for the host country smallholders. Under contract farming or outgrower schemes,



smallholders can be offered inputs including credit, technical advice and a guaranteed market, although they do sacrifice some freedom of choice over crops to be grown. Mixed models are also possible with investments in a large-scale enterprise at the centre but also involving outgrowers under contracts to supplement production. What business model is most appropriate will depend on the specific circumstances and the commodity concerned.

WHAT ARE THE DEVELOPMENTAL BENEFITS OF FOREIGN INVESTMENT?

The key issue is the extent to which benefits from foreign investments spill over into the domestic sector in a synergistic and catalytic relationship with existing smallholder production systems. Benefits should arise from capital inflows, technology transfer leading to innovation and productivity increases, upgrading domestic production, quality improvement, employment creation, backward and forward linkages and multiplier effects through local sourcing of labour and other inputs and processing of outputs and possibly an increase in food supplies for the domestic market and for export. However, these benefits will not flow if investment results in the creation of an enclave of

advanced agriculture in a dualistic system with traditional smallholder agriculture, which smallholders cannot emulate. The historical evidence on the effects of foreign direct investment in agriculture suggests that the claimed or intended benefits do not always materialize and catalogue concerns over highly mechanized production technologies with limited employment creation effects; dependence on imported inputs and hence limited domestic multiplier effects; adverse environmental impacts of production practices such as chemical contamination, land degradation and depletion of water resources; and limited labour rights and poor working conditions. At the same time, however, there is also evidence of longer-run benefits in terms of improved technology, upgrading of local suppliers, better marketing systems and improved product quality and sanitary and phytosanitary standards, for example.

Additional political, social and ethical concerns are raised where the receiving country is itself food insecure. While there is a presumption that investments will increase aggregate food supplies this does not imply that domestic food availability will increase, notably where food produced is exported to the investing country. It

could even decrease where land and water resources are commandeered by the international investment project at the expense of domestic smallholders. Extensive control of land by other countries can also raise questions of political interference and influence.

CODE OF CONDUCT

Fears that local concerns are not emphasized in investment contracts and international investment agreements, that foreign investments in land acquisition do not always lead to local long-term developmental benefits and that domestic law is inadequate have prompted calls for an international code of conduct or guidelines to promote responsible investment in agriculture. In fact many countries lack the necessary legal or procedural mechanisms to protect local rights and take account of local interests, livelihoods and welfare.

FAO, UNCTAD, IFAD and the World Bank are collaborating to develop a voluntary code of conduct highlighting the need for transparency, predictability, sustainability and stakeholder involvement and including domestic food security and rural development concerns. Such a code of conduct, based on detailed joint research concerning the nature, extent and impacts of foreign investment and best practices in law and policy, could provide a framework to which national regulations, international investment agreements, global corporate social responsibility initiatives and individual investment contracts might refer.

FAO is also developing voluntary guidelines on responsible governance of tenure of land and other natural resources in collaboration with other international organizations including UN-Habitat and the World Bank. The rationale for a code of conduct includes the considerations that: foreign investment has a great potential to help meet the investment needs of developing countries and provide broader long-term developmental benefits; international concern has been raised over the impacts on small farmers and food security of recent large-scale foreign land acquisitions and leasing; there are fears that local concerns may not be sufficiently taken into account in investment contracts and international investment agreements, and that sometimes domestic law provides inadequate safeguards; and international guidelines might promote responsible agriculture investments that would benefit all stakeholders.

QUESTIONS FOR POLICY CONSIDERATION

FOR DEVELOPING COUNTRIES:

- ▶ What policy and legal frameworks are needed to maximize benefits, particularly for local populations?
- ▶ How can targeted inward investment be encouraged? How can a receptive domestic sector be created?
- ▶ How can a positive investment climate be created?
- ▶ How can consistency be achieved between encouraging inward investment

and existing food security and rural development strategies?

- ▶ What safeguards are required regarding land-use rights and the involvement and compensation of stakeholders?

FOR INVESTORS:

- ▶ Why focus on acquisition? What alternatives are there to equity investment?
- ▶ How can outward investment be encouraged? What information and incentives are required?
- ▶ How can private sector finance be mobilized?
- ▶ What kind of national code of conduct is needed?

FOR THE INTERNATIONAL COMMUNITY:

- ▶ How can investment programmes be devised to meet investment needs – matching capital to opportunities?
- ▶ Is there a need for an international mechanism to cover covering investment agreements and dispute settlement?
- ▶ How can global corporate social responsibility initiatives be brought into the process?

For further information



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THE CHALLENGE

Agriculture both affects and is affected by climate change. Agricultural and food production will be adversely affected by climate change, especially in countries that are already climate-vulnerable (drought, flood and cyclone prone) and that have low incomes and high incidence of hunger and poverty. Adaptation of agriculture to climate change will be costly but necessary for food security, poverty reduction and maintenance of ecosystem services. Also reduction of greenhouse gas emissions and enhancement of carbon sinks (mitigation) from agriculture will be necessary, if global mitigation efforts are to be successful. In fact, agriculture and forestry are by nature carbon sinks. They contribute, and could still contribute more, to mitigating climate change by storing carbon.

Climate change and bioenergy development will affect food security in all of its four dimensions – availability, accessibility, stability and utilization.

Food availability: Globally, climate change impacts on food production may be small up to a certain level of global temperature rise. However significant production decreases are expected in regions that are already food insecure. Developing countries in Africa, Asia and Latin America could experience a decline of between 20 and 40 percent in overall potential agricultural productivity if temperatures rise by more than 2 °C. More demand for liquid biofuels

for transport will increase the use of productive resources for biofuel production of biofuel feed stock diverting land, water and other resources from food production and putting increasing pressure on forests.

Access to food: Impacts on access will be mixed, as a reduction in agricultural incomes associated with climate change will reduce access to food for many of the world's poorest people. The strongest negative impact of climate change on agriculture is expected in sub-Saharan Africa, which means that the poorest and most food insecure region is also expected to suffer the largest contraction of agricultural incomes. Increased demand for agricultural commodities for the production of liquid biofuels will increase food prices for consumers while it will increase agricultural incomes for some producers. The exact impacts are not certain as they will depend on policy and energy market developments.

Stability of food supplies: Climate change will increase the variability of agricultural production across all areas, with increased frequency of extreme weather events. Increases in the incidence of droughts and floods, which are dominant causes of acute food shortages in semi-arid and sub-humid areas particularly in sub-Saharan Africa and parts of South Asia, mean that the poorest regions with the highest levels of chronic undernourishment will also be exposed to the highest degree of instability in food production. Climate change is also altering

the distribution, incidence and intensity of animal and plant pests and diseases and may result in new transmission modalities and different host species.

Food utilization: Climate change will alter the conditions for food safety by increasing the disease pressure from vector, water and food-borne diseases. The result could be a substantial decline in labour productivity and increases in poverty and mortality rates. Increases in daily temperatures could also raise the frequency of food poisoning. By contrast, improved access to bioenergy could improve indoor air quality in poor households otherwise reliant on fuelwood, charcoal or animal dung, and could reduce time spent by women on fuelwood collection, improving health and time available for child care and nutrition.

CLIMATE CHANGE ADAPTATION

Adaptation to climate change is essential for any efforts to promote food security, poverty alleviation, or sustainable management and conservation of natural resources. Many countries are already dealing with climate change impacts, including irregular, unpredictable rainfall patterns, uncommonly heavy rainfall, increased incidence of storms and prolonged droughts. In addition, changing temperatures and weather patterns have allowed for the emergence of pests and diseases that affect animals, trees and crops. All these have a direct effect on yields as well as product quality, not to

mention the availability and price of food, feed and fiber in the marketplace.

Rural communities, particularly communities in fragile environments such as mountain areas and coastal zones, face growing risks, including increased and recurrent crop failure, loss of livestock and reduced availability of fisheries and forest products. More frequent and more intense extreme weather events will have serious impacts on livelihood assets in both rural and urban areas.

Proactive and anticipatory adaptation approaches are required that address the short-term impacts of increasing climate variability but also help local communities prepare for the long-term impacts resulting from changes in mean temperatures, rainfall, salinity and sea levels. Long-term climate change impacts can emerge gradually or arrive abruptly when certain thresholds are reached. Adaptation must be an integrated, flexible process that is tailored to the local context. It is critical for adaptation activities in agriculture, forestry and fisheries to consider both the opportunities and constraints that local populations face and the diversity of systems they rely upon.

Investments made to deal with climate change should also be seen as an opportunity to increase support to the agriculture, forestry and fisheries sectors, which has declined in developing countries for the last decades.

Local people, the actual land managers, play a central role in adapting agriculture, forestry and fisheries sectors and food systems to climate change. Equally important are the policy and legal frameworks, incentives and services for rural producers that can stimulate and guide adaptation processes and link producers to markets. National and regional policies and laws for land and water management, resource use and access, environmental conservation, livelihood strategies, crop development, land-use planning, land tenure, risk management, food security and trade have great potential to influence adaptation to climate change. To be successful, adaptation activities need the support of strong institutions with clearly defined and coordinated responsibilities.

The concept of adapting to climate impacts is not new to farmers, forest dwellers and fishers. However, today, the need to increase production coupled

with the speed and magnitude of the expected changes in climate presents new challenges. Traditional ways of coping may not be sufficient to ensure adaptation in the medium to long term. Adaptation in agriculture, forestry and fisheries needs to be supported by strong research efforts and often involves substantial changes in practices that may take some time to implement or show benefits.

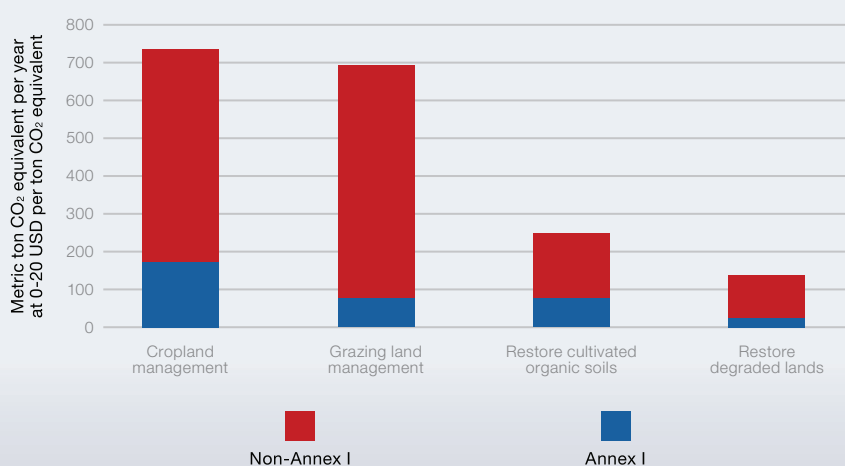
CLIMATE CHANGE MITIGATION IN AGRICULTURAL SECTORS

It will not be possible to reach the global mitigation target, if the agriculture, forestry and fisheries sectors, are not significantly contributing to mitigation. Agriculture, forestry and other land-use sectors are responsible for about a third of global anthropogenic GHG emissions. However, oceans, lakes, forests and agricultural lands also sequester and store large amounts of carbon, thus contributing to climate change mitigation.

In many areas, agriculture is the main driver of deforestation, indicating the close linkages among the different land-use sectors. According to The Stern Review (2006), reducing deforestation and forest degradation would be one of the most cost effective mitigation approaches. In addition to protection, improved management and restoration of the Ocean's 'blue forests' (kelp, macro-algae, mangroves, salt marshes and sea grasses) may also contribute towards mitigation of GHGs.

Existing forestry and agricultural practices and measures already provide mitigation opportunities. Emissions can be reduced by adopting better management practices and more efficient management of carbon and nitrogen flows. Avoiding or displacing emissions can be achieved if the energy efficiency of the agriculture sector can be improved. In addition, fossil fuel energy

Figure 1: Mitigation Potential from Agriculture, Annex I (Developed) and Non-Annex I (Developing) Countries



Source: Smith et al., 2008

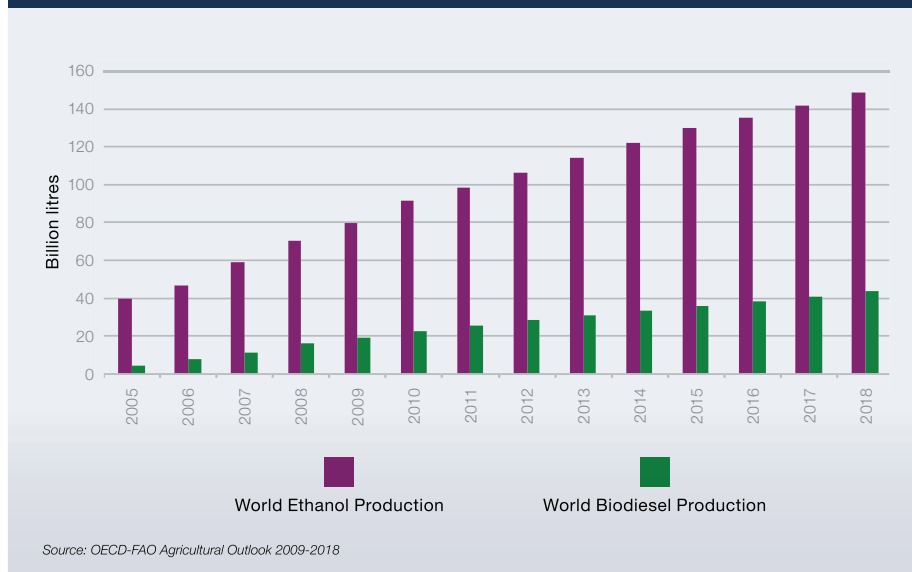
used in agricultural production can in some cases be replaced by biofuels produced from wood, agricultural feedstock and residues, algae and fish waste. Forest conservation activities can help to avoid carbon emissions.

GHGs can be absorbed from the atmosphere through sinks. In the forestry sector, activities such as afforestation, reforestation and forest restoration can increase carbon capture from the atmosphere and lock it into plant biomass, roots and soils. Sustainable forest management can help maintain the forest carbon. Carbon sequestration in crop- and grass-lands and agroforestry also has the potential to make a significant contribution to GHG mitigation. According to IPCC, 89 percent of agriculture's technical mitigation potential lies in soil and biomass carbon sequestration through different management practices, such as improved cropland and grazing land management, agroforestry and the rehabilitation of degraded lands. For example, soil disturbance is limited and soil carbon can be increased by the use of reduced or zero-tillage agriculture in association with diversified cropping patterns and increased soil cover.

While suitable mitigation technologies and practices exist, more work is needed to develop technologies over a wider 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, particularly in the context of monitoring commitments and allowing the development of effective carbon financing mechanisms.

The challenge is to design financing mechanisms for the remuneration of environmental services in general and

Figure 2. World ethanol and biodiesel projections, 2005-2018



mitigation services in particular that are provided by smallholder agriculture and forestry. These financing mechanisms need to offer incentives for providing and safeguarding ecosystem services such as watershed protection, carbon sequestration and biodiversity provision, while at the same time encouraging farmers to adopt better crop and livestock production techniques to boost their productivity.

BIOENERGY

An estimated 2 to 3 billion people rely on unsustainable biomass-based energy resources and 1.6 billion people, mostly rural poor, lack access to sustainable energy services. This situation entrenches poverty and food insecurity. National policies and programmes aimed at providing broader access to energy services for the rural poor will significantly contribute to sustainable development and the achievement of the Millennium Development Goals.

Bioenergy development has the potential to bring new investment into the agricultural sector and provide market

and employment opportunities for the 2.5 billion people dependent upon agriculture, comprising most of the 900 million rural poor. Bioenergy growth, if managed appropriately and targeted to benefit the needy people, can also contribute to improving infrastructure and market access in rural areas.

Assessments of the climate change mitigation potential of bioenergy use need to take food security and resource availability into account. Sustainability criteria are required to ensure sustainable soil and water management, and protect high biodiversity and nature reserve areas. At the same time, the rights and livelihoods of local people must be safeguarded. Improving household energy systems can significantly reduce GHG emissions at a relatively low cost.

Impacts of biofuels production on climate change mitigation have been mixed so far, as GHG emission reductions vary widely across liquid biofuels, feedstock, location and production technologies. In all cases, however, emissions reductions will be limited, and emissions can even increase if

liquid biofuel production accelerates the conversion of forests or grasslands into cropland.

By contrast, increased liquid biofuel production has already had significant impacts on agricultural markets and food security. Liquid biofuels have been the largest source of new demand for agricultural commodities in recent years. As such, they have contributed both to the recent spike in agricultural commodity prices and to the expectation that prices will remain higher in the future than they would be in the absence of increased biofuel production. It is expected that demand for agricultural feedstock for liquid biofuels will be a significant factor for agricultural markets over the next decade and perhaps beyond.

The impacts of liquid biofuel production depend critically on where and how it is produced. Innovative technologies including second generation technologies, aquatic biofuels, the promotion of sustainable production methods and integrated food energy systems, can mitigate negative impacts and promote greater benefits at all levels. There is a need to develop research into better options and to exchange experiences and knowledge on biofuel technologies so as to share benefits by all.

IN CONCLUSION

The interrelated challenges of achieving global food security, adapting to and

mitigating climate change, and meeting growing demands for energy cannot be addressed in isolation. The current impetus for investing in improved agricultural policies, institutions and technologies to meet food security and energy goals offers a unique opportunity to mainstream climate change mitigation and adaptation actions into agriculture. By the same token, a climate change agenda will need to recognize and value agriculture's potential contributions to adaptation and mitigation through options that also safeguard its contributions to global food security and overall development.

POLICY CONSIDERATIONS ARISING FROM THE FAO HIGH-LEVEL FORUM ON HOW TO FEED THE WORLD IN 2050 (ROME, 12-13 OCTOBER 2009)

- ▶ There are natural resource constraints and challenges involved with feeding a growing world population. And, there are trade-offs involved in solving some of them. For example, expansion of biofuels to solve the energy problem may exacerbate food insecurity if not managed properly.
- ▶ The forum agreed that food security needs should come first. Governments could consider controlling biofuel expansion through land-use regulations. Agriculture and energy are intertwined, with agriculture being affected not just by the amount of energy available to it, but also by the price level and volatility. Mechanisms to reduce this volatility could aid rational planning.

- ▶ Following from this, the panel recognized that increased productivity may come at the expense of sustainability. Not surprisingly, some forum participants questioned whether the international community has enough knowledge to feed the world sustainably.
- ▶ A strong and recurrent theme concerned the lack of integrated policies across sectors (e.g., agriculture, forestry, energy) and the lack of coherence in policies from the international level to the national and local levels.
- ▶ The panel recognized that crop biodiversity provides the means for crop adaptation to climate change. Panellists stressed that the Climate Change Conference in Copenhagen should acknowledge crop adaptation efforts, including conservation of diversity and its use in plant breeding programmes as an integral part of overall adaptation efforts.
- ▶ There was the view that minor and underutilized crops could be developed further and could become more valuable in future climates particularly for the poor, and that biodiversity could be used not just to increase production but also to increase the nutritional quality of the foods produced. The quantity of food produced is important, but so is the quality especially in view of a richer and more educated future population.

For further information



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Non-distorting farm support



THE CHALLENGE

The recent world food crisis highlighted the critical issue of food security, the fragility of the global food system and the need to expand agricultural production capacity in both the developed and developing countries to meet current and future food demands. The challenge is two-fold: to ensure food and nutrition security for the one billion hungry people in the world today and to feed a world population set to reach 9.1 billion by 2050.

A key issue is how to shape and design support to farmers in both the developed and developing countries while minimizing distortions to global markets that are potentially harmful to developing countries, and at the same time promoting global food supply adequacy, food security for the undernourished, and poverty reducing and growth incentives for the farmers, especially smaller ones, in low-income food-deficit countries.

Developed countries provide support to farmers to increase farm income, reduce income variability, improve competitiveness of the agricultural sector, protect against natural disasters and provide for safe and quality food. Farm support policies that stimulate domestic production can create distortions in world markets, such as lower prices, diminished import demand, and constrained market access, inducing disincentives in developing countries' agricultural production in the long run.

KEY ISSUES

DECOUPLED SUPPORT

While the value of overall OECD support to farming has been stable over time, periodic reforms since the onset of the Uruguay Round have changed the relative weight of different policy instruments, with increased reliance on the so-called decoupled support in line with WTO provisions. Payments based on area, historical entitlements, input constraints and total historical farm income are viewed as "decoupled" from current production decisions and hence considered to have a lesser impact on production and trade.

Decoupled policies include not only support for land set-asides, but also support for technology and farm human capital skills, incentives to maintain set-aside land in production-ready and environmentally sustainable condition and other similar policies, and could be an option with physical commodity reserves. Productive land set-aside can be brought into physical production in high-income countries within 6-10 months (the recent supply response is evidence to that), providing a powerful reserve to food shortages, while at the same time not distorting current global markets with overproduction.

THE RISE OF INSURANCE RELATED SUPPORT

As OECD farm support shifts from commodity-based to decoupled measures, farm incomes have become more variable,

and public safety nets in the form of risk mitigation measures such as revenue or weather insurance are increasingly relied upon to provide protection. While in OECD countries there is private insurance available for most agricultural risks, in some cases public insurance support tends to crowd the private insurance sector out, and may create incentives for increased and riskier production activities, which can become distortive.

For publicly supported insurance schemes to be non-distortive, they need to address market failures such as the very unpredictable and low probability but highly damaging events, which are normally not insured by the private sector but which can be devastating for farmers. The other "more normal" risks can be handled by the private market and farmers themselves through a variety of instruments, including index insurance, modern risk management financial instruments, etc.

MARKET ACCESS IN OECD COUNTRIES

Border policies that restrict market access from third countries are trade distorting. Market access restrictions come in the form of tariff barriers and a wide range of non-tariff measures. They are trade and production distorting through their protective effects on local producers. Exports from developing countries into OECD markets still face high import barriers, except for countries that benefit from preferential tariff access. Analyses

show that market-access restrictions vary widely across countries, and greatly impair nearly 30 developing countries. In rich countries, they are concentrated in the meat, dairy products, sugar and tobacco sectors. High tariffs on temperate zone food products and low tariff rates on tropical products seems a typical post Uruguay Round pattern of protection in many developed countries. Tariff escalation is still sizeable and could have major impacts on agro-industry development in the developing countries. Developing country agricultural trade could significantly expand if OECD countries allowed increased access to their markets and reduced their domestic agricultural subsidies and import tariffs.

EXPORT MEASURES

Export subsidies have distorting effects since they provide incentives to produce, and the export of surplus production tends to drive down world prices. Over time, the combined effect of export subsidies and domestic support by OECD countries for these commodities may have contributed to reduced developing countries' own production, greater reliance on increased imports and changed consumption patterns.

Export credits allow foreign buyers to defer payment under more favourable terms than available from financial institutions. A justification for their use is that the recipient country suffers from liquidity constraints

and hence their use may enhance rather than distort trade. In practice, poorer countries appear to have received only a small proportion of available export credits.

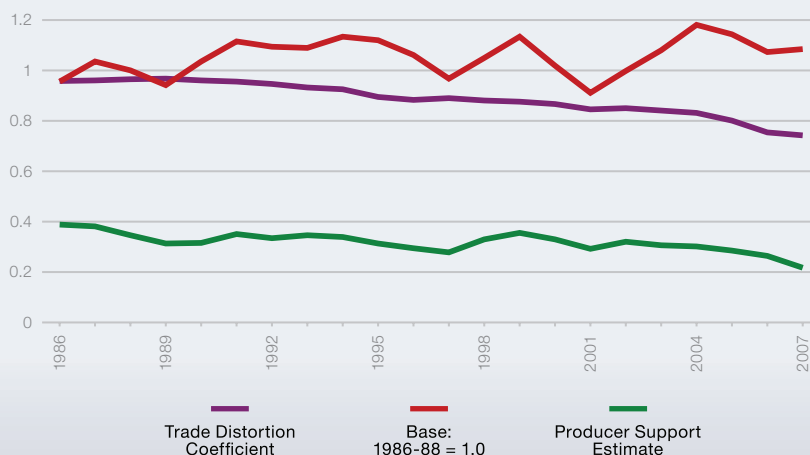
Food aid may also distort trade if there is no "consumption additionality". Emergency food aid is fully additional since recipients are without access to the additional food needed. Non-emergency food aid has varying degrees of additionality and hence distortive effects.

SUPPORT TO AGRICULTURE DURING DEVELOPMENT

In developing countries, farm policies have been driven largely by the goal to accelerate a transition from low-income agrarian structures and rural economies into more developed industry-based economies. At early stages of this transition, the policies adopted are usually aimed at keeping food prices and hence wages low. The overall effect of such policies, as measured by Nominal Rates of Assistance (NRA), has largely been to tax agricultural producers (namely negative NRAs) (Figure 2). By and large the agricultural sectors in many developing countries have faced negative policy biases, low growth rates, and high poverty incidence, while resulting in increased food import dependency.

At later stages of the transition, namely when average incomes grow (typically at a per capita income level of USD 8000 or

Figure 1: OECD Agricultural Support 1986-2007



Source: Skully, 2009



SOME BASIC FACTS

► The monetary value of total OECD support to farming has been more or less stable over time, despite periodic reforms since the onset of the Uruguay Round. According to OECD, from 1986-87 to 2005-07, the ratio of producer support to the value of production declined from 40 to 29 percent. Consequently, the aggregate trade-distortion coefficient for OECD agricultural support declined from 0.96 in 1986 to 0.74 in 2007 (Figure 1).

- The global environment under which the OECD support policies operate has changed over time, from endemic excess supply and falling real commodity prices, to rising prices despite slower demand growth.
- Rising bioenergy demand is estimated to have accounted for 30% of the increase in weighted average grain prices between 2000 and 2007. Although food commodity prices have decreased since their peak in 2008, they are expected to remain higher by historical standards.

more), and the share of farmers in total employment declines, the farm support policies in developing countries seem to turn positive with NRAs increasing as the share of agriculture in the economy declines and average agricultural and total incomes increase (Figure 2).

Today, however, there is growing agreement that agricultural growth is key to expansion of the entire economy. There is empirical evidence that GDP growth originating in agriculture is more effective in alleviating poverty than growth originating in non-farm sectors. This has stimulated a shift in policy in support of agriculture, particularly smallholder, and related activities. The *L'Aquila Food Security Initiative* of the G8 (July 2009) is a case in point.

TRADE POLICY IN DEVELOPING COUNTRIES

Trade policies in developing countries range from very low applied tariffs in lower income countries to middle and higher applied tariffs in some middle income developing countries. Trade policies need to complement domestic investment policies and strategies. As such, policy space, for instance in the form of border measure flexibility such as Special Product provisions to allow for “development gaps”, needs to be justified in terms of ability to support domestic investments or smallholder farmers.

Figure 2. Average Nominal Rate of Assistance (NRA) to agricultural producers as a function of country per capita income



Many developing countries have undertaken major economic reforms since the 1980s, including phasing out agricultural export taxes, reducing manufacturing protection and allowing markets to determine the value of their currency. However, product and especially factor market distortions in many agricultural sectors continue to be large. Trade policy must be integrated in such a way that it contributes to the fundamental objectives of poverty reduction and sustainable development to benefit the poor and food insecure people. It should foster equitable growth, promote human development, and ensure the proper management of natural resources and the protection of the environment.

INPUT SUBSIDIES

If effectively applied, input subsidies could play an important role in agricultural development and stimulate food production, raise farm income and improve food and nutrition security. However, there are risks of costly and ineffective design and implementation using scarce resources. Depending on local conditions, input subsidies are most effective in boosting production and inducing growth multiplier effects in staple foods, especially in countries with incomplete or non-existent markets, and may necessitate complementary investment policies. Input subsidies in the past have suffered from weaknesses in design and implementation

► **Developing countries and households are not affected uniformly by the trade distortions from OECD policies owing to selective trade preferences for some countries and different net import or export positions among countries and among different households (rural, urban) within the same country.**

► **For developing countries, declining agricultural investments over two decades due partly to low prices, combined with removal of support services (credit, marketing, input assistance etc.), have had negative impact on agricultural growth (and in some cases outright decline of production, yields and quality). This has led to sharp reductions in farm incomes and rising rural poverty.**

in some regions, and greater emphasis may need to be placed on developing the infrastructure for input supply and accessibility as part of long term investment strategy.

SMALLHOLDER SAFETY NETS

Developing countries agriculture is much more exposed to various natural and market risks. For lack of other instruments and safety nets, much of developing country small producers' savings capacity is spent in self insurance. In addition they often become trapped in low-return but low-risk production activities. Policies to reduce the risks faced by low-income farmers and to help such producers cope with negative shocks could be instrumental in unleashing their own savings potential and moving them out of their poverty traps. In addition, public policies should also incorporate safety nets that address threats to food and nutrition security, as well as payments to farmers for environment services. Market-based safety nets, including weather index-based insurance, could be useful supplements to other relevant domestic support measures. Examples of measures that reduce income and price risks and uncertainty include investing in information infrastructure to enable insurance markets, market information systems to improve market transparency and facilitate exchange, clear and stable laws and legal frameworks and targeted insurance and safety nets against crop failures, droughts and other catastrophes.

MANAGING GLOBAL FOOD CRISES

Recent events suggest that there is a need for the establishment of global safety mechanisms against food crises emanating from economic shocks. One possibility could be an early reaction system designed to revive food production particularly in low-income food-deficit countries, building on mechanisms already in place for natural disasters or conflict crises. Another mechanism could deal with the issue of inadequate import trade finance during periods of high food prices. There is a need for strategies and institutions to assure all net food importing countries proper access to supplies in times of crises.

QUESTIONS FOR POLICY CONSIDERATION

A key challenge for policy-makers is how to shape and design support to farmers in both developed and developing countries to meet their separate national objectives without hurting farmers in third countries, while at the same time promoting global food adequacy and food security, and minimizing trade and market distortions.

► What types of support measures can be used to ensure that farmers who remain in rural activities boost their agricultural productivity and production to meet future food economy challenges? What forms of non-distorting support may be appropriate in developing and developed countries? Do smallholder farmers in developing countries require specific coupled support in the short, medium and long run to become more productive and competitive?

- Could decoupling in OECD support policies be expanded more evenly among OECD countries and for all agricultural commodities? Could decoupled policies be linked to maintenance of agricultural "production reserves" in high income countries?
- Given the continued levels of support to developed country farmers, could OECD countries offer compensatory financing for agricultural investments or other agricultural growth enhancing measures to low income countries?
- Should OECD countries limit publicly supported agricultural insurance to deal mostly with extreme and unpredictable agricultural risks that cause market failures, and leave other risks to be covered by the private sector?
- What may be the characteristics of an early reaction fund to help farmers in low-income food-deficit countries to revive their production in case of a food crisis due to economic shocks?
- What types of institutions and arrangements can assure net food importing countries proper access in times of global food crises?
- Can mechanisms be developed for smallholders to benefit from the carbon credit offset system?

For further information



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Sub-Saharan Africa – realizing the potential



THE CHALLENGE

After decades of decline in per capita food production, a new optimism has emerged about the prospects for Africa and African agriculture. Growth in agriculture and in the economy as a whole has outpaced population growth in many countries, armed conflicts have been reduced, regional and sub-regional institutions are being strengthened, and good progress has been made in developing the business environment. There is wide agreement that African agriculture has enormous potential for growth thanks to its abundant natural resources, namely land and water.

Agriculture in sub-Saharan Africa has responded to a better macroeconomic environment, and improved price incentives brought about *inter alia* by reduced

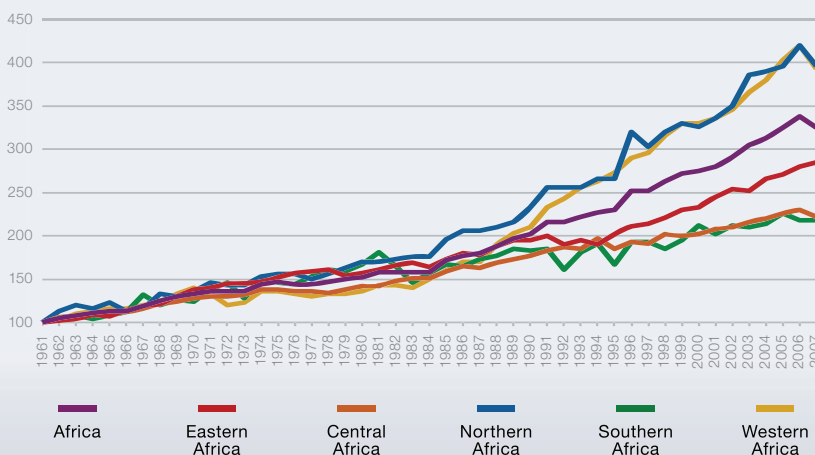
“taxation” of agriculture and higher world prices. The negative rate of protection for Africa as a whole improved from about minus 20 percent in 1975–79 to less than minus 10 percent in the first half of the present decade, and to near zero in 2005. The positive prospects for Africa’s agriculture will not materialize, however, without concerted and purposeful policy action and massive investments, especially if agricultural growth is to be sustained and if it is to result in substantial reduction of malnutrition and poverty.

Many challenges need to be overcome, including the widening technology divide, poor infrastructure, declining technical capacity, weak input and output marketing systems and associated market services, slow progress in regional integration, governance and institutional shortcomings

in some countries, conflicts, and high incidence and prevalence of HIV-AIDS and other diseases.

Improving capacity to develop and deploy improved agricultural technologies and policies, improving farmers’ access to water and modern inputs (high-quality seeds, fertilizers, etc.), building rural infrastructure (roads, storage, etc.), connecting smallholders to markets and helping them to adapt to new conditions and become more productive, increasing opportunities for rural employment, reducing risk and vulnerability especially to extreme weather events and price swings, and increasing access to credit, assets and skills will be the priority actions needed to ensure that agricultural and rural growth goes hand in hand with poverty reduction. These will need investments, both public and private.

Index of Agricultural Production (1960=100)



Source: FAOStat

THE ISSUES

NATURAL RESOURCES

Despite abundant natural water supplies at the continental level, this abundance is not evenly distributed and to date Africa has not been able to intensify its agricultural production through irrigation and improved water management (water harvesting and storage). Less than 4 percent of sub-Saharan Africa’s water resources are mobilized and less than a quarter of the total land area suitable for rainfed crop production is used. The moist savannah agro-ecology has huge potential for increasing crop and livestock

production if properly managed, following lessons learned from other regions, such as the innovations that have brought major production increases to the Cerrados of Brazil. FAO has estimated that the potential additional land available for cultivation amounts to more than 700 million ha. But at the same time, it must be recognized that to open up new farmlands will require enormous investments in infrastructure and technology as well as appropriate safeguards to avoid potential negative environmental impacts.

TECHNOLOGY

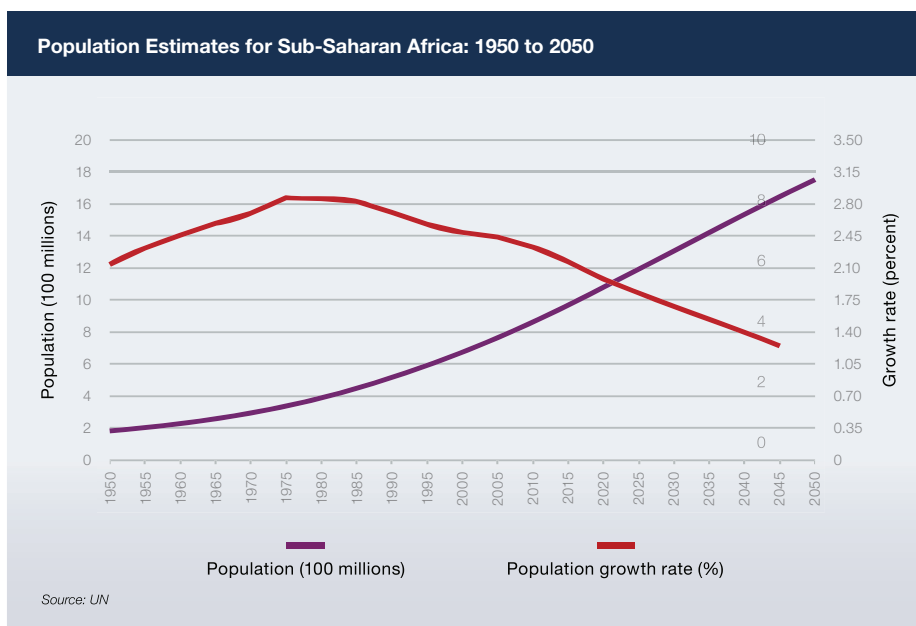
A fundamental challenge to achieving agricultural productivity growth in Africa is

the variety of agro-ecological environments and farming systems and the large number of staples it produces. Yield gains associated with high-yielding varieties have been much lower in sub-Saharan Africa than in other regions, partly as a result of the inadequacies of input and output markets, extension services and infrastructure. Conservation Agriculture could constitute a viable complementary option given the climate, infrastructure, capital and labour situation in parts of Africa. There are also options available for closing the significant performance gaps in animal production through the application of advanced genetics, feeding systems, animal health control and other

animal husbandry, production and product processing technology at various levels. Their implementation so far has been limited by weak institutions both upstream and downstream. Also with the right, locally adapted technologies, the region holds significant potentials in fisheries and aquaculture production.

PROSPECTS FOR SMALLHOLDER FARMERS

Smallholder agriculture is the predominant form of farm organization in Africa. Therefore, agricultural growth (especially that of staples) and hunger and poverty reduction will be closely associated with growth in smallholder agriculture. However, food systems are being transformed into globally integrated, more knowledge-based, capital-intensive chains. Cheaper capital, the introduction of new technologies and higher opportunities for off-farm employment, are factors that work towards changing the optimal size of farms in favour of larger holdings. The result may over time be an increase in the average farm size, land consolidation, increased commercialization of agriculture and possibly forced migration out of the sector. In this process, small-scale farmers will be under pressure to adapt. This points to the urgent need for locally adapted programmes, plans and policies to increase the capacity of smallholder farmers to



SOME BASIC FACTS

- ▶ For the continent as a whole, economic growth was well above 5 percent until 2008, and for sub-Saharan Africa, above 5.5 percent. Much of this growth since 2000 has been driven by exports of primary commodities.
- ▶ Agricultural growth in sub-Saharan Africa has been more than 3.5 percent, well above the current annual rate of population growth of two percent
- ▶ Nevertheless, 212 million people in sub-Sahara Africa, some 30 percent of the total population, suffered from chronic hunger and malnutrition in 2004–06. This number is estimated to have increased to 265 million in 2009 due to high food prices and the economic crisis. About 38 percent of children under the age of five are affected by chronic malnutrition.
- ▶ The population of sub-Saharan Africa is projected to grow from some 770 million in 2005 to between 1.5 and 2 billion in 2050. Despite rapid rural-urban migration, the absolute number of rural people is also likely to continue to grow.
- ▶ Cereal yields have grown little and are still around 1.2 tonnes per hectare in the region, compared to an average of some 3 tonnes per ha in the developing world as a whole.
- ▶ Fertilizer consumption was only 5 kg per ha in sub-Saharan Africa in 2007, compared to 62 kg in the Middle East and North Africa, 127 kg in South Asia and 152 kg in South America.

boost their productivity and make them more competitive, allowing them to enter dynamic sectors for national, regional and international markets. Investments in favour of small producers should be increased.

LINKING AGRICULTURE TO NUTRITION SECURITY

Narrowing the nutrition gap in sub-Saharan Africa, where the difference between actual and optimal intake is greatest, and the incidence of undernourishment is highest, is imperative. Improved food security must occur in conjunction with improved nutrition security which refers to the “quality” component of food production, consumption and physiological need. Investing in research to improve the macro and micronutrient content of crops, and investing in extension services to increase knowledge of plants that can be used to increase crop diversity and dietary diversity are necessary for narrowing the nutrition gap.

LOW CAPITALIZATION AND INVESTMENT

Sub-Saharan Africa’s agriculture is grossly undercapitalized. This reflects both insufficient investment as well as rapid growth in the region’s rural population. Insufficient investment in agricultural production value chain development and support services can have a severely detrimental impact on the food security of

Table 2: Transaction cost advantages of small and large farms

	Small farms	Large farms
Unskilled labour supervision, motivation, etc	X	
Local knowledge	X	
Food purchases and risk (subsistence)	X	
Skilled labour		X
Market knowledge		X
Technical knowledge		X
Inputs purchase		X
Finance & capital		X
Land		X
Output markets		X
Product traceability and quality assurance		X
Risk management		X

Source: Poulton et al. 2005

the majority of the poor and hungry, who live in rural areas and depend directly or indirectly on agriculture for their livelihoods. Currently, there is a pressing need for substantial investment in public goods that support agriculture, notably research and extension, rural roads, large water projects, education, and health care. A favourable investment climate calls for well-functioning institutions that effectively allocate and protect property rights, promote trading, reduce risk and facilitate collective action.

IMPORT DEPENDENCY

Many of the least developed countries in Africa have become increasingly dependent

on imported food in recent decades. This dependency may not be a serious issue *per se*, so long as other export sectors can be developed to generate revenues to pay for food imports and the availability and stability of food commodities in world markets are guaranteed. Consumers in these countries may have benefited from the low prices of imported food resulting from, *inter alia*, farm subsidies in rich countries, but the recent price spike demonstrated the precariousness of this position, while at the same time highlighting the challenges farmers, especially the smallholders, in developing countries face in trying to expand production in response

- ▶ Only 4 percent of arable land in sub-Saharan Africa is irrigated, compared to about 20 percent globally and 38 percent in Asia.
- ▶ Some 65 percent of the cropped land in sub-Saharan Africa is prepared by hand, 25 percent with draught animals and less than 10 percent by tractor. Projections to 2050 show that the use of tractor power will lag behind all other regions by some 50 percent.
- ▶ High post harvest losses characterize agricultural production in Africa and could be as high as 15 percent in cereals, pulses and oilseeds, up to 30 percent in roots and tubers and up to 40 percent in some fruits and vegetables. For cereals, the losses incurred represent around 17 million tonnes every year.
- ▶ The introduction of advanced genetics, feeding systems, animal health control and other production technology has spurred

livestock productivity, particularly in the rapidly growing sub-sectors of poultry, pigs and dairy supplying urban centres, and in some temperate highland areas. However, livestock productivity overall remains low.

- ▶ Forests in sub-Saharan Africa are crucial for the livelihood of millions of people who rely on their services for daily subsistence and represent vital carbon sinks and biodiversity zones. Africa holds 16 percent of the global forest area, and produces about 19 percent of global roundwood (2006). Fuelwood accounts for about 90 percent of roundwood production. Africa’s a gross value added in the forestry sector is USD 14 billion.
- ▶ Sub-Saharan Africa currently accounts for only 1.2 percent of global aquaculture production, amounting to 0.6 million tonnes.

to higher prices. This demonstrates the supply-side constraints that exist in these countries. The structural solution for sub-Saharan Africa to achieve food security is to increase its agricultural production and productivity, particularly by small farmers and rural households.

CLIMATE CHANGE

Climate change is expected to affect negatively agriculture, forestry and fisheries in most regions of Africa including through more frequent extreme weather events like floods and droughts, but it will also create new opportunities in some regions where rainfall and other climate parameters may improve. Other opportunities arise from the possibility of carbon trading and offsets. According to the Intergovernmental Panel on Climate Change (IPCC), yields of rainfed crops in sub-Saharan Africa could fall by 50 percent by the year 2020. Climate change should be mainstreamed into general agricultural and risk mitigation agendas, and capacities for agricultural technology development should be enhanced. Especially critical is the need to develop crop varieties and livestock breeds that are adapted to changing climatic conditions and to promote innovations that increase soil organic matter and cover the soil to improve resilience to droughts and floods.

HIV-AIDS

Africa's failure to grow as rapidly as the rest of the developing world has left a legacy of poverty and hunger. Low growth has not only reduced domestic resources available for investing in infrastructure, agricultural development, health, education and nutrition, but it has also aggravated the HIV-

AIDS crisis, which involves a vicious spiral of poverty and disease. In rural areas, HIV and AIDS have depleted the agricultural work force and further retarded production. In addition, the inter-generational transmission of knowledge has been interrupted in many rural communities due to the premature deaths of smallholders who die before teaching their children important farming skills.

INSTITUTIONAL REFORMS

State institutions for agriculture in Africa are particularly weak in the poorest countries. Institutions are needed that support farmers and strengthen the functioning of national and regional markets (input, output, regulatory, risk management, information, a framework for organizations and cooperatives) and those for the management of climatic and other risks. Political stability and peace are still issues that require attention.

POLICY CONSIDERATIONS ARISING FROM THE FAO HIGH-LEVEL EXPERT FORUM ON HOW TO FEED THE WORLD IN 2050 (ROME, 12-13 OCTOBER 2009)

- ▶ Development efforts in sub-Saharan Africa should give top priority to agriculture given its important contributions to national GDP, employment, income generation and export earnings. Special attention should be given to rural areas where the majority of the poor and food insecure lives.
- ▶ The Comprehensive Africa Agricultural Development Programme (CAADP) has become a focus for producing strategies and plans to stimulate agriculture. CAADP is changing the way that agricultural development is planned and financed.

Led by African governments and the African Union, it brings together different stakeholders. CAADP recognises the complexity of agriculture and that there are correspondingly multiple entry points for agricultural growth. Much effort is going into translating that vision into country programmes and projects.

- ▶ The current imperative is to work with smallholder farmers to improve their access to markets, both input and output, and to credit to increase their productivity and incomes. Nevertheless, with the industrialization and globalization of agriculture, in the future there could be fewer full-time smallholder farmers and land increasingly farmed in larger units.
- ▶ Africa has a greater diversity of ecosystems and correspondingly of farming than other regions. A green revolution for Africa will thus not be the same as that seen in Asia.
- ▶ The many environments of Africa may mean that a proportionately greater investment in research will be needed. Governments need to commit more funds to research both to ensure that enough is carried out and that there is national and regional ownership of the research agenda.
- ▶ While there is a growing sense that Africa needs to rely on its own resources for agricultural development – as Asian countries did a generation ago – there are serious concerns with the terms on which Africa trades with the rest of the world. Subsidies to farmers in OECD countries and trade restrictions still harm the prospects of African farmers on both their domestic markets and in export markets.

For further information



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The contribution of technology



THE CHALLENGE

Global food production needs to increase by 70 percent by 2050 in order to feed an additional 2.3 billion people. Food production in developing countries needs to almost double, and 80 percent of the cereals production increases are projected to come from increases in yields and cropping intensity. But the fact is that globally the rate of growth in the yields of the major cereal crops has been steadily declining. The challenge for research and development in food and agriculture is to reverse this trend.

The challenge is made more pressing by climate change, which is expected to have a significant impact on agricultural production. According to the Intergovernmental Panel on Climate Change (IPCC), if temperatures rise by more than 2°C, global food production potential is expected to contract severely and yields of major crops may fall globally. The declines would be particularly pronounced in lower-latitude regions. In Africa, Asia and Latin America, for instance, yields could decline by between 20 and 40 percent if temperatures rise by more than 2°C and no effective adaptation measures are taken.

Technology progress will be needed to address various issues. For instance, an increasing demand for liquid biofuel may put additional pressures on global agricultural production. More research on and deployment of second generation

biofuels technologies could make a key contribution to alleviate pressure on edible crops and natural resources. Technology change will also be needed to address the problem of rapidly increasing water scarcity and to reduce post-harvest losses.

THE ISSUES

CLOSING YIELD GAPS

Yield and performance gaps in both crop and animal agriculture exist mainly because known technologies are not applied in farmers' fields. One main reason is that farmers do not have sufficient economic incentives to adopt yield-enhancing seeds or production techniques. This may be explained by numerous factors, including lack of access to information, extension services and technical and managerial skills. Poor rural infrastructure, weak institutions and unfavourable farm policies can also create obstacles to the adoption and diffusions of technologies. Solutions lie with public sector investments in institutions and infrastructure, better research-extension linkages and sound policies to stimulate adoption of technologies that improve productivity and reduce costs. Changes in agricultural management techniques can also help close yield gaps along with a more efficient and sustainable use of genetic resources. Breeding plays an important role by adapting varieties and breeds to local conditions and by making them more resilient to biotic (e.g. insects, diseases, viruses) and abiotic stresses

(e.g. droughts, floods). The global yield loss due to biotic stresses is estimated at over 23 percent of the attainable yield across major cereals. Many developing countries have not adequately invested in plant breeding, seed multiplication and delivery, or in modern production agronomy.

In the livestock sector, genetic progress contributes on average between 60 and 80 percent of annual productivity gains. It is projected that up until 2040, productivity gains in the ruminant sector will be driven by technology change generated in industrialized countries, much of which however will be transferable to production systems in developing countries where it will contribute to efficiency gains.

INCREASING INPUT USE EFFICIENCIES

Increasing input use efficiencies in agricultural production will be essential as natural resources are getting scarcer, and prices of non-renewable resources like fossil fuels, nitrogen, and phosphorus are expected to increase.

► **Conservation farming** using reduced tillage, soil cover and rotations, offers a major opportunity to reduce fuel use in agriculture by an average of 66 to 75 percent as well as sequester soil carbon. Conservation agriculture (CA) can improve crop yields and farm profitability, improve soil productivity and make agriculture more sustainable, providing greater resilience against drought and

other stresses. Payments for soil carbon sequestration could provide additional incentives to adopt CA.

► **Fertilizer consumption** is expected to rise in developing countries. Nitrogen represents 90 percent of fertilizer consumption. Fossil energy accounts for 70-80 percent of the cost of manufacturing nitrogen fertilizer. Because major efficiency gains in manufacturing nitrogen have already been made, it is likely that fertilizer prices will in the future rise in line with energy prices. Precision agriculture and integrated plant nutrient management systems provide new tools for further improving efficiency.

► **Resource use efficiency** in livestock and aquaculture production has made major progress. In poultry, breeding for high performance and improved feed conversion ratio (FCR) and reduced mortality due to better hygienic management have significantly reduced the amount of feed (and land needed to produce this feed). Genetic improvements and good farm management practices were able to considerably improve growth performance and FCR for fish species such as tilapia and carp.

► **Integrated pest management (IPM)** aims to minimize the amount of pesticides applied by farmers by using other

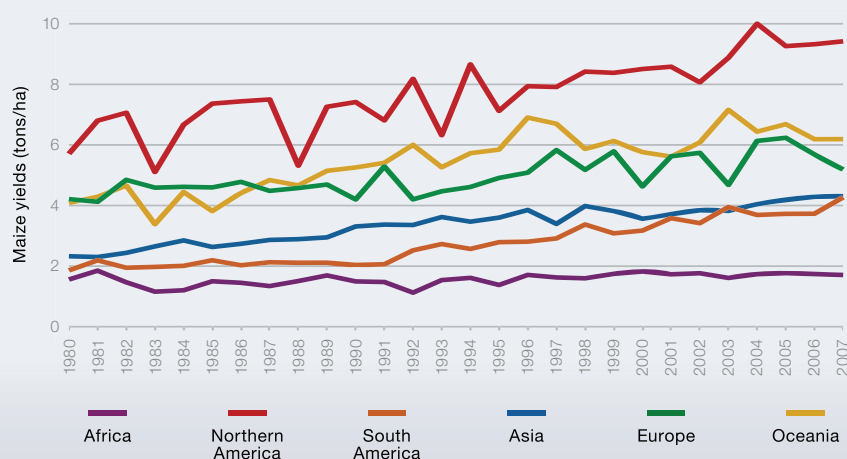
control methods more effectively. Pest incidences are monitored and action is taken only when the crop damage exceeds certain tolerable limits. Many countries (e.g. Niger, Mali, Jordan, India, Bangladesh and Viet Nam) have introduced IPM and have experienced increased production accompanied by lower financial, environmental and human health costs.

► **Irrigation.** FAO estimates that some 1.2 billion people live in countries and regions defined as water-scarce, and the situation is projected to worsen, with the number rising to 1.8 billion by 2025. Yet the benefits of irrigation are immense, with a productivity differential between irrigated and rainfed areas of about 130 percent. Over the past decade, irrigation alone accounted for about 0.2 percent of the 1.1 percent overall annual yield growth rate of cereals. Experts estimate that at present in developing countries, irrigated agriculture, with about 20 percent of all arable land, accounts for 47 percent of all crop production and almost 60 percent of cereal production.

BREEDING AND USE OF BIOTECHNOLOGIES

The sustainable utilization of genetic resources for food and agriculture plays an important role in closing yield gaps by adapting crops, forages, domestic animals

Figure 1: Historical development of maize yields, by geographic region



Source: FAOStat



SOME BASIC FACTS

► The Green Revolution played a key role in raising agricultural production over the past 40 years. Yield increases for major cereals (wheat, rice, maize) amounted to 100 to 200 percent since the late 1960s. However, yield growth rates were unequally distributed across crops and regions: despite the successes in cereal crops, yield growth for millet, sorghum, and pulses - which are major staples for resource-poor farmers and rural households - was slow.

► Large and economically exploitable yield gaps remain in many places, especially in the developing world and nowhere more so than in sub-Saharan Africa (see figure 1). Similarly, very considerable performance gaps need attention in livestock production and aquaculture.

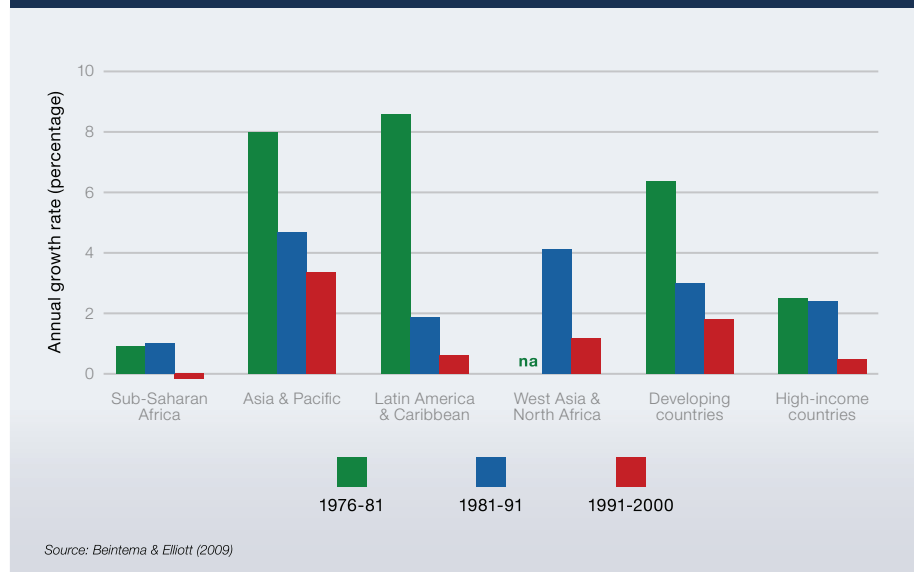
► Public investments in agricultural R&D worldwide grew from USD 16 billion in 1981 to USD 23 billion in 2000, with large inter- and intra-regional differences. While public investments in the Asia-Pacific region (driven by China and India) more than doubled over

and aquaculture fish to local conditions and by making them more resilient to biotic and abiotic stresses. To date 50 percent of the yield improvement in major crops has been attributed to conventional plant breeding and the remainder to crop management practices. Conventional plant breeding will continue to constitute an integral part of plant improvement in the future with modern biotechnology tools such as marker-assisted selection. Biotechnology-based diagnostic systems are also gaining increasing importance in crops, forest trees, livestock and fish as well as for food safety purposes while the development of vaccines using biotechnologies could provide an important option for preventing and managing animal diseases. Appropriate use of biotechnology has potential for the development of agriculture, forestry and fisheries. But given the various concerns about genetically modified organisms (GMOs), caution is needed in introducing them. Also efforts must be made to spread benefits to small-scale farmers, the poor and the hungry in a responsible way.

INVESTMENTS IN AGRICULTURAL RESEARCH AND DEVELOPMENT

In low-income countries, agricultural R&D is the most productive investment in support of the agricultural sector. Massive public and private investments in R&D are required today in order for agriculture to benefit from

Figure 2: Annual growth rates in agricultural R&D, by geographic area



effective technologies in the future given that benefits from agricultural research tend to materialize after a considerable time lag. In 2002, FAO estimated that an incremental USD 1.1 billion (at 2002 prices) would have to be invested every year into strengthening the capacity for knowledge generation and dissemination in order to reduce hunger effectively. The R&D agenda should include strategies to adapt or develop effective technologies for food production, preservation and storage, suitable for resource-poor farm families. Increased research and knowledge dissemination for indigenous food crops would also have a positive impact on household food security and improved nutrition status.

More investments in agricultural R&D are also needed to address the emerging challenges of water scarcity and climate change adaptation. Broadening the agricultural research agenda includes the development of more effective public research systems and financing mechanisms as well as increased investments in agricultural education, and enhancing access to, and exchange of, information and knowledge. Increasing private sector involvement in agricultural R&D also means addressing issues of intellectual property rights (IPRs) and ensuring that a balance is struck so that access of poor farmers to new technologies is not actually reduced. Appropriate regulatory systems that are

this period, investments in sub-Saharan Africa only grew at an annual average rate of 0.6 percent from 1981 to 2000 and actually fell during the 1990s (see figure 2). Agricultural R&D investments are increasingly concentrated in a few leading countries in each region.

► Poultry is the fastest growing livestock subsector, but receiving only 3 percent of public R&D investment and is largely driven by private sector investment. Developments in poultry breeding, feeding and housing have enabled unprecedented increases in output and productivity.

► Aquaculture is also a rapidly growing sector, by an average of about 7 percent annually over the last three decades, producing 50 million tonnes in 2007. Production is still concentrated in Asia while significant opportunities also exist in many other regions.

► In 2008, genetically modified crops worldwide were cultivated on 800 million hectares in 25 countries (15 developing and 10 developed countries). Herbicide tolerant soybeans are the major genetically modified crop, occupying 53 percent of the total area under genetically modified crops, followed by maize (30 percent), cotton (12 percent) and canola (5 percent).

adapted to a country's needs and effectively enforced IPRs will be essential to stimulate private sector investments.

EXTENSION AND ADVISORY SERVICES FOR INFORMATION, KNOWLEDGE AND TECHNOLOGY DISSEMINATION

Spreading knowledge, skills and technology is a major challenge. In many countries, investments in extension services have been drastically cut. Public extension services declined, but new forms of extension and advisory services have emerged in response. Private enterprises took over some of the advisory services, especially those related to inputs in profitable areas but not those related to food crops. In countries where civil society evolved, NGOs, farmers' organizations, Farmer Field Schools and others are providing services. Yet, overall there is little coordination among the different stakeholders as well as insufficient monitoring and research to compare and assess the performance of the different institutions and to measure their impacts.

Most extension systems, including public, private and civil society providers, remain severely under resourced, badly equipped, gender imbalanced and with limited access to training, new information and technologies. In many regions of the developing world, women form the majority of farmers, while many advisory and training services are targeted primarily to men. Rebuilding and strengthening public institutional capacity and empowering farmers' organizations and women should be a priority.

POLICY CONSIDERATIONS ARISING FROM THE FAO HIGH-LEVEL EXPERT FORUM ON HOW TO FEED THE WORLD IN 2050 (ROME, 12-13 OCTOBER 2009)

- ▶ In order to make significant contribution to food security, technologies and policies should:
 - be developed for a purpose, using participatory approaches;
 - be targeted towards real farmers, i.e. women and smallholders;
 - be adapted to local environmental and social conditions;
 - be supported by appropriate policies;
 - contribute to sustainable productivity growth.
- ▶ No amount of technology and/or external assistance can feed a nation that does not itself prioritize food security and agriculture in its budget and development plans.
- ▶ Organic agriculture was advocated by some panellists; however, other panellists and participants who included farmers, representatives of farmers, scientists and policy-makers spoke in favour of a variety of options, as farmers continuously face new and unpredictable challenges. It was mentioned that with use of just 9 kg/ha of fertilizers, African farmers were 'organic' by default.
- ▶ Improved information exchange among farmers, researchers, extension workers and policy makers was needed for development and deployment of useful technologies.
- ▶ Gene-based technologies will likely play a large role in feeding the world in 2050 but policies should ensure that such technologies are available to, and affordable by, smallholder farmers.
- ▶ Integrated and sustainable crop-livestock systems are important to increasing food production and mitigating climate change.
- ▶ The forestry sector contributes to food security via packaging, transporting and cooking. More than 50 percent of rural household energy in 2050 will still come from fuelwood.
- ▶ Sustainable wood production could be achieved through soil treatment, weed control, fertilization and development of fast-growing plantations.
- ▶ Enhancement of farm power in sub-Saharan Africa needs special attention.

For further information



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THE CHALLENGE

The latest UN estimates of population suggest that by 2050 the planet will be populated by 9.1 billion persons, up by 2.3 billion from the current population of 6.8 billion. This represents a 34 percent increase over the next 41 years. The latest FAO estimates indicate that agricultural production would need to grow globally by 70 percent over the same period (by almost 100 percent in developing countries) to feed this population, driven by an increase in demand and a shift towards higher value products and an increased use of crop output as animal feed to meet rising meat, milk and egg demand. These predictions of additional output needs are likely to be a low estimate, as they do not account for feed requirements in aquaculture and any potential increases to meet possible expansion in demand for liquid biofuels for the transport sector.

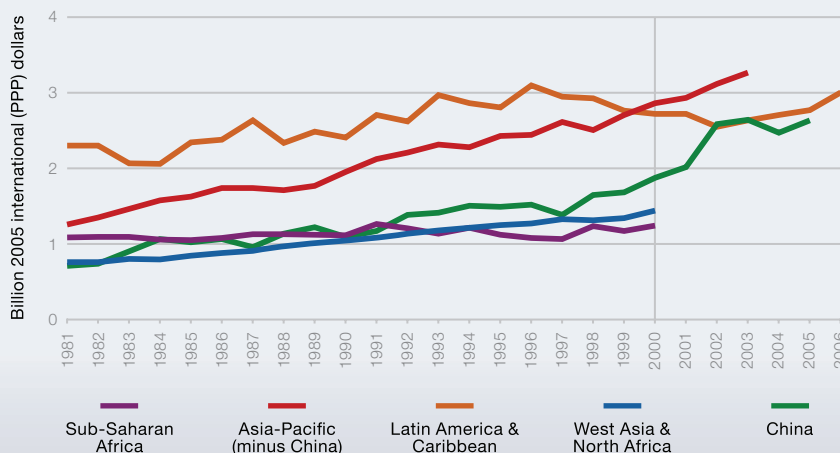
Already today, over one billion people worldwide are undernourished. In developing countries, one in three children under the age of five is stunted and 148 million children are underweight. Micronutrient malnutrition affects approximately two billion people, more than 30 percent of the world's population. Agriculture development has a key role to play in the reduction of food insecurity and malnutrition. However, investment and growth in this sector have been slow over the past decade. Overall, national and international priorities, as reflected in poverty reduction strategies and development plans, often fail to address key factors underlying agricultural sector growth, rural development, and food and nutrition security. Long-term investments in agricultural development, efforts to build institutional capacity and empower organizations of rural poor people, and

emergency and safety net initiatives that address the needs of those currently unable to provide for themselves are not linked and harmonized.

FAO estimates that the investments required in developing countries to support the required expansion in agricultural output amount to an average gross annual investment of USD 209 billion in 2009 prices (or USD 83 billion net of depreciation). This total includes investment needs in primary agriculture and necessary downstream services such as storage and processing facilities, most of which will be funded from private sources (including farmers), but it does not include essential public investment in roads, large irrigation projects, rural electrification, improved education and others that are also needed such as the management of aquatic resources. It is estimated that gross annual investment in the agricultural capital stock of developing countries is currently about USD 142 billion (2009 prices), so the required increase is about 50 percent of the current level.

Another challenge is to increase capital stocks in areas that are lagging both in terms of hunger reduction and agricultural productivity. Analysis of long-term trends of investment in agriculture since the 1970s showed that, in general, the countries that performed best in terms of reducing hunger were also countries that manifested higher net investment rates per agricultural worker. Throughout the 1990s, the value added per worker in the group of countries with less than 2.5 percent of the population undernourished was about 20 times higher than in the countries with more than 35 percent of undernourished population.

Public agricultural R&D investment trends in developing countries, 1981-2006



Source: Beintema and Elliott, 2009

THE ISSUES

WHAT KIND OF INVESTMENTS?

Most of the investment, both in primary agriculture (including livestock, aquaculture, fisheries and agroforestry) and downstream sectors, will have to come from private sources, primarily farmers themselves purchasing implements and machinery, improving soil and pond fertility, etc. For a better functioning agricultural system and improved food security, four kinds of public investments are also needed:

- ▶ direct investment in agricultural research and development (R&D);
- ▶ public and private investments into the management of natural resources that are critical for sustainable growth in production and increasing productivity

in particular land and water resources, wild capture fisheries, forests and related ecosystems;

- ▶ investment in sectors strongly linked to agricultural productivity growth, such as R&D institutions, extension services, roads, irrigation schemes, ports, power, storage and marketing systems; and
- ▶ non-agricultural investment to bring about positive impacts on human wellbeing, like the reduction of hunger and malnutrition. This includes education (particularly of women), sanitation and clean water supply, healthcare and safety nets.

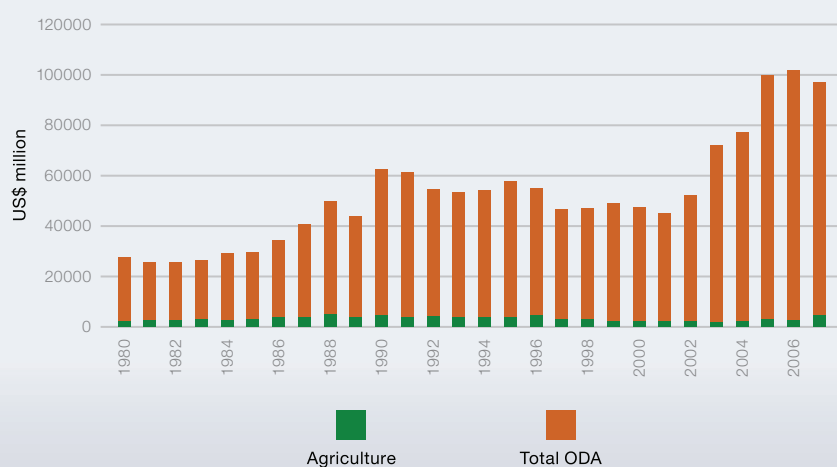
Farmers and prospective farmers will invest in agriculture only if their investments are profitable. Many types of public goods, such as the above mentioned, that make

private investments financially viable can only be provided by the public sector. Public sector research and extension must be strengthened to deal with important food crops that have little potential for private sector investment. Local private sector investment needs to be encouraged at all stages – upstream of the farm, in national seed and soil enhancement inputs, fertilizer production and distribution, and downstream in storage, processing, marketing and distribution. Countries need to create a favourable investment climate for rural producers and address issues such as land tenure, management of water and fishery resources, lending policies to agriculture, risks and limitations on the ability of micro-finance systems to bring about a step-change in production and productivity. Climate change will make it imperative that national programmes develop the capacity to breed or at least re-select crop and fish varieties adapted to the changes; seed multiplication and production systems must also be in place so farmers have access to the new adapted varieties.

REGIONAL NEEDS

The outlook to 2050 suggests that inter-regional differences are likely to become more pronounced in terms of capital stock per worker, which will be roughly doubling in East Asia, South Asia and the Near East and North Africa regions, tripling in Latin America, but stagnating in sub-Saharan Africa. This means that by 2050, an agricultural worker in Latin America would have 28 times the capital available to his counterpart in sub-Saharan Africa. The

Official Development Assistance 1980 – 2007



Source: OECD



SOME BASIC FACTS

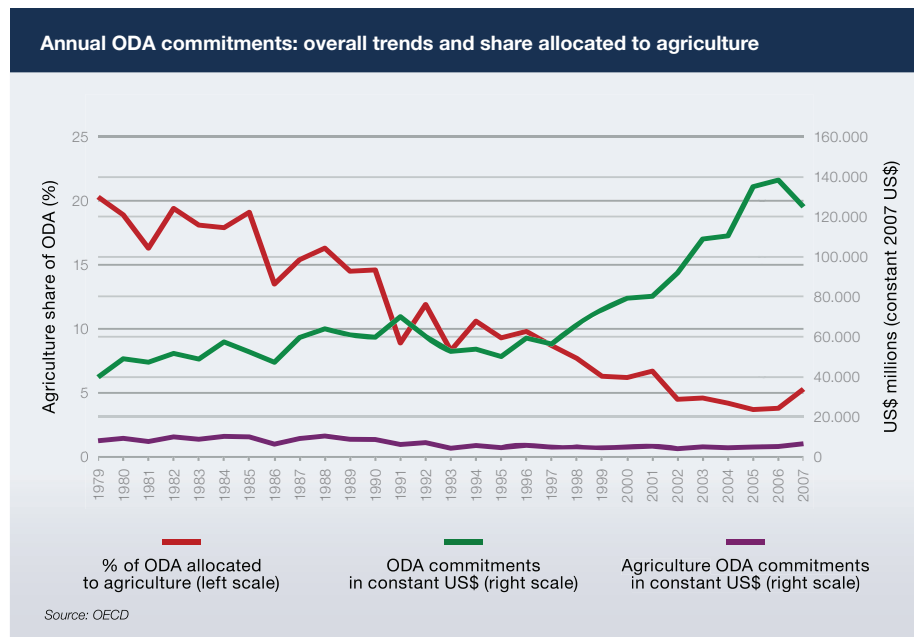
- ▶ There has been a global slowdown in the rate of accumulation of capital stocks in primary agriculture (net investment). While such stocks grew annually at 1.1 percent in the period 1975-1990, the rate was only 0.5 percent during 1991-2007.

- ▶ Growth of the population active in agriculture has outstripped growth of agricultural capital stock in sub-Saharan Africa and South Asia, regions where many countries experience the highest prevalence and greatest depth of hunger. Countries with more than 35 percent of the population undernourished saw capital stock in agriculture grow annually by 1.3 percent between 1975 and 2007, while population grew by 2.3 percent.

huge differences in capital intensity are at the heart of differences in output per worker. A critical element in the divergent developments in labour productivity across regions is largely a reflection of the different developments in the agricultural labour force of the various regions. In Latin America, for instance, labour force employed in agriculture will be almost halved, while in sub-Saharan Africa it will nearly double.

INTERNATIONAL INVESTMENTS

The capacity of the poorer developing countries to fill the investment gap is limited. The share of public spending on agriculture has fallen to an average of around 7 percent in developing countries, even less in Africa, and the share of ODA going to agriculture has fallen to as little as 3.8 percent in 2006. The capacity for managing natural resources that sustain food production are in the decline in many countries. Commercial bank lending to agriculture in developing countries is also small – less than 10 percent in sub-Saharan Africa. Private investment funds targeting African agriculture are an interesting recent development but actual investments are still small. Given the limitations of alternative sources of investment finance, foreign direct investment in developing country agriculture could make a significant contribution to bridging the investment gap. Such investment has been increasingly directed towards land acquisition and leasing, with investor motivation varying among liquid biofuel production, portfolio diversification and food security concerns of the investing country. Although there are



potentials for developmental benefits from this type of investment through technology transfer, employment creation, infrastructure development and export earnings, the related food production increases are often meant to be exported to the investing country, raising a number of possible political, economic and social concerns when investments are made in a country that itself is food insecure. The key issue is whether the prospects for food security and poverty reduction in developing countries, and globally in general, are better with or without such investments, and what are the best ways to maximize benefits and avoid negative effects.

RESEARCH AND DEVELOPMENT

Investments in agricultural research, education and development have been

shown to have very high rates of return and have an important role to play in fighting hunger and poverty. At present, much public research is carried out by the international centres of the Consultative Group on International Agricultural Research (CGIAR). While there is no doubt about the utility and benefits provided by this system of international research bodies and affiliated organizations – which have contributed enormously to the global pool of available agricultural technology and knowledge – the question of how to increase and sustain the financing of such bodies is not straightforward, as often governments do not perceive as in their interests to make substantial contributions towards an entity whose benefits will be spread well beyond the scope of their constituents or borders. It is clear that massive public and

► Looking ahead to 2050 and broken down by type of investment, 60 percent of the total needed would go to replacing obsolete capital stock; the rest would go to additions to the capital stock (i.e. gross capital formation). Broken down by activity, primary agriculture would get about 40 percent while the remainder would go to downstream needs (processing, transportation, storage, etc.). Within primary agriculture, mechanization would account for the single biggest investment area followed by expansion and improvement of irrigation.

► Development aid to agriculture decreased by some 58 percent in real terms between 1980 and 2005, even though total official development assistance (ODA) increased significantly – by 112 percent – over the same period. This meant that the share of ODA going to the agricultural sector fell from 17 percent in 1980 to 3.8 percent in 2006, with the same downward trend observed in the lending portfolios of international financial institutions and development banks. Presently agriculture's share in total ODA stands at around 5 percent.

private investments in R&D need to be made if agriculture is to benefit from the use of new technologies and techniques and to successfully overcome emerging challenges, including increasing water scarcity and climate change.

POLICY CONSIDERATIONS ARISING FROM THE FAO HIGH-LEVEL EXPERT FORUM ON HOW TO FEED THE WORLD IN 2050 (ROME, 12-13 OCTOBER 2009)

The discussion of investment was arranged around five major issues raised by the presenter and the moderator.

- ▶ The panel agreed that both appropriate policies and a critical mass of investment

are essential in achieving the Millennium Development Goal of hunger reduction in the world. Without the right policies in place, even significant investments pumped into the system will not necessarily bring the desired result.

- ▶ The degree to which investments result in progress in hunger alleviation varies from country to country. China and India have demonstrated very significant success in hunger alleviation, and there was general agreement that CAADP sets a sound framework for investment in sub-Saharan Africa. However implementation in some cases has not been effective and investment has not always reached

the intended target, thus the need for improvement.

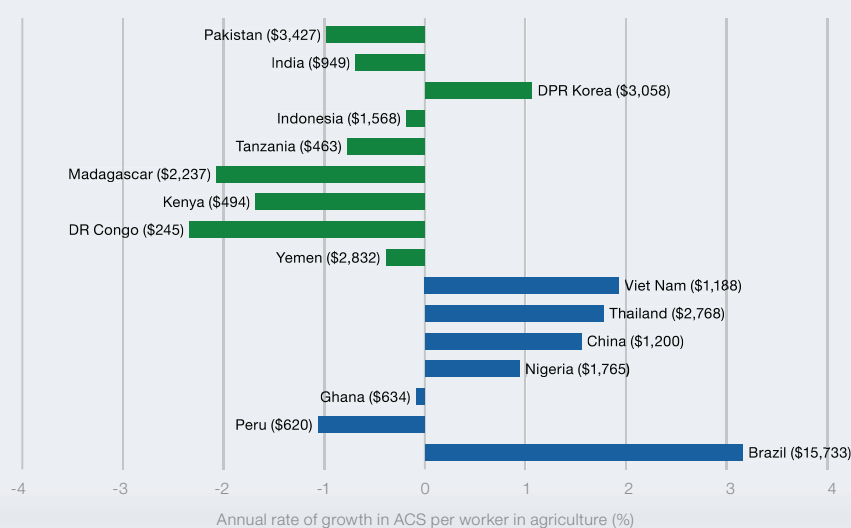
- ▶ The key elements in creating an attractive environment for investors are a sound regulatory framework and reasonable taxation. Private equity funds were proposed as an innovative instrument for attracting private investments, especially in situations where banks are not eager to lend to agriculture. Smallholder associations can also be a useful instrument to help small producers accumulate funds for investment. An additional policy tool considered by the panel was state support for start-up investments, which normally have higher risks and need external support.

- ▶ All panellists agreed that increased public investment in infrastructure and agricultural R&D are crucial for attracting private capital to agriculture. For most developing countries, it is very important to reduce the risks facing private investors, especially smallholders.

- ▶ The panel agreed that increasing cross-boarder foreign investment in primary agriculture directed towards acquisition or leasing of land has the potential to increase resources available for agricultural development, but that special discipline should be imposed on such investments to safeguard the interests of all concerned parties, and particularly the local populations.

Finally, there was general agreement with the observation that in the future the quality of investments will be at least as important as the volume of investments.

Annual rates of agricultural capital stock (ACS) growth (1990-2005) in countries that have made the most progress or suffered the largest setback towards the 1996 World Food Summit targets



Source: Cramon-Taubadel et al, 2009

For further information



World Summit on Food Security
Rome 16-18 November 2009

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THE CHALLENGE

Transboundary animal diseases (TADs) and plant pests (PPs) have been affecting livestock and crop production from immemorial time. In fact, they were among the ten plagues of ancient Egypt. As a result of high mortality of productive animals and drastic reduction of productivity of surviving animals, livestock keepers and farmers were periodically confronted with famines, hunger and distress, but because of the extensive character of production systems and relative isolation of production areas and countries at that time, the magnitude of subsequent crises was relatively limited: the spread of pathogens was quite slow and most of the TAD were entrenched in well defined areas (enzootics) or contained in groups of countries in the same region (epizootics).

Nowadays, the movement of plant pests and animal diseases across boundaries has given rise to global threats to food security, agricultural, aquaculture and fisheries development and trade and often creates global concern on public health especially when such diseases and pests affect humans. Increased movement of people, terrestrial and aquatic animals, plants and products in the globalized economy on the one hand, and the concentration and intensification of production systems on the other, have accelerated and enlarged redistribution of animal diseases and plant pests with a clear tendency to expand to all regions of the globe (panzootics and pandemics). In addition, climate change

is creating new ecological niches for the (re)emergence and spread of pests and diseases. As a result, the impact of TADs, and PPs has considerably increased. There are indications that the poorest countries with vulnerable sanitary regulation and infrastructure carry a larger burden than others. The list of imported exotic diseases and pests has grown while no substantial progress has been made in the control of local entrenched pathogens. Poor countries and producers may perceive different risks and incentives associated with TADs and PPs, and it is essential to recognize these differences in the design and implementation of disease and pest prevention and control measures. It is in the interest of the international community to avoid creating country or regional reservoirs for TADs and PPs that will maintain the threat at global level.

KEY ISSUES

Animal diseases and plant pests reduce the availability of food and affect quality. Although quantification of losses and potential losses due to transboundary pests and diseases is limited, historically, animal disease and plant pest introduction, establishment, re emergence and outbreaks have resulted in major food problems either directly through yield reductions of food crops and losses in animals (or spill over into humans), or indirectly through the reduction of yields of cash crops and lost of consumer confidence, e.g. HPAI, rinderpest, potato blight or locusts.

ANIMAL DISEASES AND ZOOSES

Many animal diseases, including zoonoses, have been or can be at the origin of major regional or international crises. Rinderpest was a major cattle scourge in large parts of Europe, Africa and Asia for centuries, bringing about massive depopulation of livestock and wildlife. The rapid spread of the H5N1 avian influenza (HPAI) virus in Southeast Asia in 2004 and then into Europe and Africa in 2005, was accompanied by the fear that a human influenza pandemic might emerge from domestic poultry. More than 60 countries were affected by virus incursions, over 300 million poultry died or were destroyed, and millions of farmers and producers suffered losses running into billions of dollars. The current human influenza pandemic due to the pandemic H1N1/2009 virus has spread with astonishing speed worldwide. Given the dense populations and close contacts between pigs, poultry and humans in many parts of the world, there is serious global concern that re-assortment of viruses hosted by humans, pigs, or birds may catalyze the emergence of a more virulent strain.

Foot-and-mouth disease is endemic in most parts of Asia, Middle East, Africa and parts of South America. Vector-borne zoonotic diseases such as Rift Valley Fever continue to affect parts of Africa, threatening to spread to the Middle East, the Gulf countries and southern Europe. Trypanosomosis and East Coast Fever are among the most devastating diseases in

sub-Saharan Africa. They affect more than 500 000 people and kill more than 3 million animals each year. Furthermore, other existing infectious diseases such as African Swine Fever, *Peste des Petits Ruminants*, Contagious Bovine Pleuropneumonia, Classical Swine Fever and Newcastle disease are widespread in Africa, Asia and Latin America and continue to be a major source of concern to the global community.

In aquaculture, the White Spot Syndrome Virus in shrimp is considered as the most serious pathogen of cultivated shrimp. Recorded shrimp viral epizootics show the range and distance that aquatic animals can travel alongside the movement of their hosts – the major pathway being movement of infected post-larvae, fingerlings and broodstock. At present there are more than 20 shrimp producing countries affected.

CROP PESTS

The desert locust is the best known example of migratory crop pests because of the speed at which outbreaks occur and the scale that infestations can reach when plagues become fully developed.

Locusts may spread over about 30 million square kilometres and affect as many as 60 countries. In the last major desert locust plague from 2003 to 2005 the livelihoods of about 8 million people were affected in North and Northwest Africa. More than 13 million hectares were sprayed with chemical pesticides in order to bring an end to the plague. But investment in preventive emergency management systems is particularly advantageous. Through development of early warning, human capacity building and rapid response systems, at least three outbreaks and upsurges were successfully controlled in the Central Region before damage to livelihoods of the communities occurred. The development cost of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) Desert Locust programme in the Central Region has been USD 11.5 million over ten years; the cost of the control operations was USD 7 million. By contrast, the total cost of the campaign and rehabilitation in North and Northwest Africa in the absence of a preventive management system has been estimated at over USD 390 million.

NEW AND EMERGING THREATS

New and re-emerging plant pests have raised fear of their potential impact on livelihoods, food security and global markets; some examples are:

- ▶ Recent locust outbreaks in Central Asia, Southeast Asia, and Central and Southern Africa surfaced raising concerns with regard to locust species other than the desert locust, putting the livelihoods of more than 15 million people at risk in Central and Southern Africa alone.
- ▶ A new cross-border bio-threat developed in 1999 when a virulent strain of the wheat stem rust disease (Ug99) emerged in East Africa and reached Iran in late 2007. The regions of the Near East, Eastern Africa 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.
- ▶ Armyworms are caterpillars that develop into nocturnal moths, capable of long-distance migration. Compared with locust



SOME BASIC FACTS

- ▶ The livestock subsector supports food security and livelihoods of over one billion people. Production and trade in animals and animal products are important for the economic development of countries and represent a key income source for the rural poor worldwide.
- ▶ The livestock sector represents around 40 percent of the value of world agricultural output, and is one of the fastest growing subsectors of the agricultural economy.
- ▶ Livestock diseases impair livelihoods by reducing productivity and exclude countries from participating in the rapidly growing global trade in animals and animal products. Animal diseases are a major limiting factor for efficient animal resource use and sector development.
- ▶ With the growing intensification of animal production, incidence and risks of transboundary diseases, including zoonoses, are expected to rise. The higher density of domestic animals and humans, the projected increase in transcontinental movement of people and animals, and changes in ecosystems create a conducive environment for the rapid emergence, amplification and spread of pathogens.
- ▶ Crop production provides about 84 percent of global food, feed and fibre needs and virtually all other human endeavours depend on food security. Crop pests, including diseases, insects, and weeds should be overcome to meet future needs.
- ▶ Global crop losses due to transboundary pests are estimated at more than 50 percent of potential crop output. Insect pests are estimated to have caused the destruction of 15 percent of crops, and 13 percent each by pathogens and weeds, and post-harvest

outbreaks, armyworms usually occur first on a smaller scale but may extend over several hundred square kilometres. The losses caused to cereals and sugar-cane in sub-Saharan Africa are estimated at 20 to 60 percent.

- ▶ Unlike migratory pests, quarantine pests and diseases can be introduced to a country mainly by trade and movement of people. Fruit flies, for example, aphids, cassava mosaic virus, banana wilt, are increasingly important as transboundary pests. Economic losses due to fruit flies alone are estimated at more than USD 1 billion per year.
- ▶ The larger grain borer originally arrived from Central America in the 1980s, first in the United Republic of Tanzania and then Kenya. During the last 20 years, this storage pest has spread over many countries in West, Central and East Africa. The beetle is causing devastating post-harvest losses of up to 90 percent on stored maize and on dried cassava, both primary staple foods in most African countries.
- ▶ The encroachment of humans and livestock into areas not previously used

in agriculture increases the contacts between domestic and wild animals and their pathogens.

- ▶ The lucrative trade in exotic animals and in bushmeat increases the risk of the spread of transboundary animal diseases and the emergence of zoonotic diseases that have previously not been identified.
- ▶ The spread of aquatic animal diseases can be aggravated by globalization, intensification of farming practices, introduction of new species, expansion of the ornamental fish trade, unanticipated interactions between cultured and wild populations, climate change and other human-mediated movements of aquaculture commodities.

POLICY CONSIDERATIONS

Transboundary animal diseases and plant pests represent a serious threat to global food security in all of its dimensions – availability, stability, access and utilization (safety). They reduce production and productivity, disrupt local and national economies, threaten human health and

exacerbate poverty. They can also result in huge financial losses and require prevention and control measures and eradication programmes.

DISASTER PREVENTION

More cost effective, livelihood saving and ecologically less devastating prevention strategies require timely and coordinated reaction from national, regional and international partners and the ability to mobilize resources at short notice to address both life and livelihoods risks as well as environmental concerns. Emergency prevention can be defined as actions taken in anticipation of an emergency to facilitate rapid and effective response to a threat and aims at:

- ▶ Early warning and detection systems providing relevant and timely information and analysis for effective decision-making.
- ▶ Governments and relevant partners prepared to prevent, mitigate and manage threats to agriculture, food and health.

CAPACITY DEVELOPMENT

Strengthening the capacities of national veterinary and plant health services and

pest infestations another 10 percent. Losses of 100 percent occur in specific circumstances, creating enormous variability in productivity and risks to the livelihoods of farm families.

- ▶ Most threatening are outbreaks of migratory pests because of their sudden emergence, often without or with limited warning, triggered by changing ecological conditions or agricultural practices which favour an explosive increase in the pest population and its rapid spreading into neighbouring areas. The unexpected appearances of such massive pest outbreaks hit the countries which in most cases are ill prepared, with no or only poor capacities to effectively cope with rapidly evolving and fast moving threats.
- ▶ The aquaculture sector is being challenged by infectious diseases that are constraining the development and sustainability of the sector through direct production losses, increased operating costs, restrictions of trade and impacts to the environment and

biodiversity. Estimates of losses due to aquatic animal diseases range from USD 17.5 million (White Spot Disease of shrimp in India in 1994) to a global estimate of more than USD 3 billion resulting from shrimp diseases. Movement of aquatic animals has been recognized as a major pathway for the introduction and spread of aquatic animal diseases.

- ▶ In forestry, due to climate change, the mountain pine beetle, a pest of North American forests, is expected to decrease in generation time and winter mortality, which will increase the risk of range extension into vulnerable ecosystems.

systems should be a top priority in coping with transboundary bio-threats in a more effective manner. This includes development of self-reliant training capacities, development of appropriate legal and policy frameworks, introduction of economic and environmentally sound coping technologies, building national surveillance and diagnostic systems, support to adequate infrastructure and tools, and practised contingency plans and field exercises.

PROTECTING LIVELIHOODS

To address the challenges of large-scale emergencies caused by transboundary bio-threats more effectively and to provide better coordinated and timely assistance to the affected countries, several considerations are critical to protect livelihoods, health and nutrition, and food security:

- ▶ Disaster risk reduction and prevention should have priority and should ensure cross border multistakeholder programmes and coordinated approaches.
- ▶ The international community and the public need to be made aware that investment in emergency and disaster prevention is economically beneficial and reduces pressure on already vulnerable communities.
- ▶ Support should be given to build human capacities, enhance networking among stakeholders, regional and interregional cooperation between affected countries, and to develop self-reliant surveillance systems, knowledge bases, tools and standards to implement transboundary management concepts.
- ▶ Regional organizations and research institutes should play a more active part to systematically address transboundary animal and plant health issues.
- ▶ The scientific community and industry should be involved in developing environmentally friendly control technologies and strategies.
- ▶ All stakeholders, including producers at all levels and capacities, must be engaged in the design and implementation of disease and pest prevention and control measures to protect their livelihoods and to ensure their participation.
- ▶ Partnerships and coordination among relevant international, regional and national organizations as well as financial institutions should be encouraged and fostered.

For further information



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Global governance of food security



THE CHALLENGE

Global food and nutrition security has deteriorated and continues to represent a serious threat to national and international peace and security. Today more than 1 billion people suffer from chronic hunger, representing 15 percent of the world's population. Of those, about 150 million have joined the ranks of hungry people due to the combined effects of soaring food prices and the global financial and economic crisis. However, hunger has been on the rise even during periods of low food prices and healthy economic growth. 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, points to a serious need for reform of the global food security governance.

The world agricultural system and the resources it draws upon also need urgent attention. Unless purposeful action is taken now, the future performance of the world agricultural system will not be commensurate with the increased demands for food, fibre and fuel. Growth in agricultural productivity is slowing with the rate of growth in yields of major cereal crops declining steadily from 3.2 percent in 1960 to 1.5 percent in 2000. And yet, having to feed 9.1 billion people in 2050, most of whom will be located in urban areas, will require an

increase in agricultural production by 70 percent from the average of 2005–2007 triennium. Demands for bioenergy, which may divert food and feed crops to biofuel production, and the associated price effects can threaten food security. Unless action is taken to develop new technology and increase productivity, diversion of resources to biofuel production may result in severe difficulties in feeding *everyone* adequately. The long- and short-term effects of climate change will present further challenges to agricultural production and food and nutrition security. The aggregate negative impact of climate change on African agricultural output is estimated to be between 15 and 30 percent by 2080–2100. Trends in public investment for agriculture in critical sectors such as research, extension, infrastructure and biodiversity are seriously lagging behind. It is obvious that a more coherent and effective response is required to address challenges of such magnitude at the global level.

REFORMING GLOBAL GOVERNANCE OF FOOD, AGRICULTURE AND NUTRITION

Global governance of food security refers to a mechanism that will facilitate debate, convergence of views and coordination of actions to improve food security at global but also at regional and national levels. This concept was first introduced at the turn of the 20th century when the League of Nations

recognized the need for some form of multilateral world food security arrangement. It was not until the FAO and the UN were created in 1945 that a vision of world food security extending beyond the bounds of nations or regions was articulated.

High level political summits, such as the UN World Food Conference in Rome in September 1974, the International Conference on Nutrition in 1992 and the World Food Summits in 1996 and 2002, endeavoured to create the foundations of an international governance system for food security. Commitments were made to combat hunger and food insecurity and structures were created within the UN system to address food and nutrition security.

The Committee on World Food Security (CFS) was created in 1974 following the World Food Conference to serve as the intergovernmental body within the UN system to review and follow up policies and programmes concerning world food security. As an intergovernmental mechanism, the CFS is universal. It is open to all Member Nations of FAO and Member States of the United Nations and to representatives of other international organizations, NGOs, civil society and the private sector. In 1996, the CFS was charged by the World Food Summit (WFS) with the responsibility to monitor the implementation of the WFS Plan of Action.

However, the leadership required to make substantial and rapid progress towards global food security was not successful, partly due to the prolonged neglect by governments of the underlying causes of hunger, and partly due to lack of coherence and convergence among policies and programmes of countries, donors and other stakeholders.

RECENT DEVELOPMENTS

Over the last few years, especially in the wake of soaring food prices and the global economic and financial crisis, widespread concerns about food and nutrition security have been raised. Renewed political attention has been given to world food security and its governance with the intention to address both the effects of crises, but more importantly, the long-term, structural factors that contribute to hunger, food insecurity and malnutrition. Pledges to increase resources devoted to agriculture and food security especially in those countries most in need have been renewed. The progressive realization of the right to food has been considered in various fora as an important over-arching framework for food security.

A number of national and regional efforts (policies and programmes) have been developed through a participatory process to promote food and nutrition security at national and sub-national levels and a conducive policy framework for growth of agriculture. Existing and emerging regional and sub-regional responses (such as NEPAD/CAADP and Latin America *sin hambre*) promote integration, coherence and consistency of national level efforts. The drive for greater policy and

implementation coherence is also evident in the efforts of donor coordination through the Paris Declaration and the Accra Agenda for Action. The International Alliance against Hunger (IAAH) was established after the World Food Summit: *five years later* as a multi-sector, multi-stakeholder mechanism to capitalize on experiences and reinforce initiatives at the national level.

In response to the devastating impact of high food and fuel prices on global food security, the UN High-Level Task Force on the Global Food Security Crisis was created in April 2008 to promote a comprehensive and unified response by UN bodies by facilitating the creation of a prioritized plan of action and coordinating its implementation at national level. At the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy (FAO, June 2008) and the G8+ Summit in Japan (July 2008, Tokyo Declaration) concrete proposals were made for the creation of a Global Partnership for Agriculture and Food. This was reaffirmed at the Madrid High-Level Meeting on Food Security for All (January 2009), where the Food Security and Nutrition were added to the calls for a global partnership. These proposals were further discussed at the FAO Conference in November 2008, at the G8+ L'Aquila Summit in July 2009 and at the G8 Summit in Pittsburgh in September 2009.

In July 2009, the G8+ Summit in Italy gave rise to the L'Aquila Food Security Initiative where those present committed themselves towards a goal of mobilizing USD 21 billion over three years to improve agriculture and food security in a more coordinated, comprehensive manner. Since then a

number of meetings within the context of The Road from L'Aquila have been held with concerned international bodies and donors to prepare a systematic approach to translate L'Aquila commitments into concrete plans and practical steps.

In addressing fundamental concerns over food security and nutrition, these initiatives have called for a new design of the governance of world food security, building on and reforming existing institutions, and strengthened partnerships. The functions of the organizations addressing agriculture and food security need to be realigned, strengthened and coordinated to meet new and emerging challenges.

These initiatives have led to partial solutions toward coherence and convergence (e.g. coherence among UN agencies or groups of countries like the G8). However, it is evident that greater coherence in the global governance of food security is still needed to encourage convergence of policies and actions taken by *all stakeholders*. The latter include 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, as well as the food industry, which has large research and development capacity and extensive supply chains and market penetration. Working together, these stakeholders can contribute more effectively towards eliminating chronic hunger, food insecurity and malnutrition and preventing future food security crises from occurring.

TOWARDS A GLOBAL PARTNERSHIP: THE REFORMED COMMITTEE ON WORLD FOOD SECURITY

The most recent and promising initiative to strengthen coordination and partnerships to combat hunger and food and nutrition insecurity is the reform of the Committee on World Food Security (CFS). The reform package, which was approved by CFS members on 17 October 2009, aims to make CFS "... a central component of the evolving Global Partnership for Agriculture, Food Security and Nutrition [that will constitute] the foremost inclusive international and intergovernmental platform for a broad range of committed stakeholders to work together in a coordinated manner and in support of country-led processes towards the elimination of hunger and ensuring food security and nutrition for all human beings."

The recently concluded reform of the CFS presents a unique opportunity to improve governance. And with the involvement of relevant consultation mechanisms at national level, it provides a basis for an effective and efficient global partnership on agriculture and food security. Features of the renewed CFS include:

► *Successful global coordination* of effort to eliminate hunger and ensure food security for all. This includes supporting national anti-hunger plans and initiatives; ensuring that all relevant voices are heard in the policy debate on food and agriculture; strengthening linkages at regional, national and local levels; and basing decisions on scientific evidence and state of the art knowledge.

► *Inclusion*: give voice and effective roles to a wider range of organizations working with food security and nutrition from UN agencies like the International Fund for Agricultural Development (IFAD), the World Food Programme (WFP), the UN High-Level Task Force on the Global Food Security Crisis and other UN bodies. The CGIAR Centres, the World Bank, the International Monetary Fund, the World Trade Organization and regional development institutions will also be involved, as well as civil society and non-governmental organizations. The Committee shall also be open to representatives of private sector associations and philanthropic foundations. A fundamental ingredient in food security governance will be stronger partnerships and alliances among all major stakeholders, at all levels.

► *Sound scientific base*: receive high-level scientific advice from a *High-Level Panel of Experts* on food security and nutrition and related subjects. This will ensure that the policy-making bodies are provided with the best scientific and knowledge-based analysis towards more effective solutions to ending hunger. Creating structural links between knowledge-experts and decision-making bodies is essential in effectively combating hunger and poverty.

► *A platform for discussion and coordination*: greater policy convergence including through the development of international strategies and voluntary guidelines on food security and nutrition based on best practices and lessons learned from countries who have succeeded in reducing hunger, will be

promoted. Countries and regions should be able facilitated in seeking assistance to address how hunger and malnutrition can be reduced more quickly and effectively.

POLICY CONSIDERATIONS

A number of policy considerations will have to be faced as the reformed CFS is implemented, and as the Global Partnership for Agriculture, Food Security and Nutrition takes shape. These could include:

How can one ensure that food security governance is effective?

With the building blocks of reform in place, improving global food security governance implies greater integration and coordination of reform initiatives horizontally (among countries, organizations, relevant stakeholders, etc.) and vertically (from local to global levels). The challenge is how to facilitate and accelerate such integration and guarantee that the ongoing reform in practice effectively serves the fight against food insecurity on the ground.

How can food security be embedded in national development priorities?

Hunger reduction policies are not just for better management of food and agricultural systems in times of crisis; they need to be fully integrated into national development priorities and strategies including social protection programmes. Hunger reduction objectives should feed into other global and regional programmes to make sure that food security issues are properly addressed (for example for trade and climate change negotiations, economic agreements etc.). Sustainable responses to the crises and increased resilience of food systems require priority to be given to local approaches.

How can emergencies and long-term assistance be better balanced?

There has been a tendency for short-term emergency food and agricultural aid to increase and for long-term assistance in strengthening public goods to decrease. What is the proper balance between short-term emergency response and long-term assistance so that emergencies are limited? How can improved global governance enable donors and implementing agents to ensure long-term aid in strengthening human and institutional capacity in developing countries is properly addressed?

How can food security governance be flexible and responsive to meet evolving challenges?

Contemporary causes of hunger, food insecurity and malnutrition are sometimes different from those faced during previous food crises. They are also likely to change as globalization spreads and accelerates, and as population growth decreases and urbanisation increases. The new governance system should be inclusive, considerate of members' views, flexible and able to mobilize political consensus, scientific expertise and financial and other resources as needed.

For further information



World Summit on Food Security
Rome 16–18 November 2009

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World Summit on Food Security



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Feeding the World, Eradicating Hunger

Executive Summary

By the middle of this century, the world's population is projected to reach 9.1 billion, 34 percent higher than today. Nearly all of this increase will occur in developing countries. About 70 percent of the world's population will be urban (compared to 49 percent today). Income levels will be multiples of what they are now. In order to respond to the expected demand of this larger, more urban and, on average, richer population, food production (net of food used for liquid biofuels) must increase by about 70 percent.

While it is an enormous task, the required increase in food production to meet future needs can be achieved. What is vital for the future is that major efforts are made now to protect, conserve and enhance the natural resources required to support the required growth in production of food. The greatest technical challenge is to develop and introduce new suites of productivity-increasing farming technologies, including in aquaculture, that are truly sustainable in the sense that they do not themselves inflict damage on the soil, water and ecological resources as well as on the atmospheric conditions on which future food output depends. To achieve this, it is vitally important that investment in agricultural research and development (R&D) in developing countries be significantly increased. In view of the very high rates of return, it is regrettable that such investment has been declining in many developing countries. In particular, the CGIAR Centers and the National Agricultural Research Systems need to be strengthened.

Given the near certainty that climate change will add to the many risks already facing farmers, especially the small-scale farmers who are responsible for so much of the supply of food in developing countries, the strategy for new technology development must give particular attention to enhancing the resilience of farming and aquaculture systems to exogenous shocks.

There is a need to reverse the long-term decline in investment in agriculture of developing countries and to create institutional capacities at global, regional and national levels that are able to assure universal access to adequate food. Investment in agriculture by both the public and private sectors has to be boosted, and the part of development aid going to agriculture has to be increased.

Most of the growth in food demand will come from developing countries, and this is also where the greatest production capacity potential lies. There is need for a new wave of investment in rural areas of developing countries. This must be guided by projections that show that 90 percent of the necessary production increases (80 percent in developing countries) will need to come from increases in yields and cropping intensity and only 10 percent (20 percent in developing countries) from expansion of arable land. Preliminary estimates indicate that, compared to the last decade, investments in agriculture and rural areas

in developing countries need to be increased by nearly 50 percent to deliver the projected growth of global food production until 2050. Providing the resources to underpin the growth in food production and for social security programmes will require a major reallocation in developing country budgets as well as in donor programmes.

Hunger now persists despite the existence of adequate aggregate supplies because of a lack of income and production opportunities for the poor and the absence of effective social safety nets. Experience of countries that have succeeded in reducing hunger and malnutrition shows that economic growth originating in agriculture, in particular the smallholder sector, is at least twice as effective in benefiting the poorest as growth from non-agriculture sectors. Reducing hunger in the short term also requires targeted and deliberate action in the form of comprehensive social services, including cash transfers or food assistance, health and sanitation, as well as nutrition education and training; with a special focus on the most needy and vulnerable. In many countries, permanent solutions require fundamental shifts in policies as they affect income distribution, employment, access to land and water and social inclusion. Projections show that many countries will continue to depend on international trade to ensure their food security. Although developing countries will most likely meet most of the demand growth from expanding their own production, their net imports of cereals will more than double from 135 million tonnes in 2008/09 to 300 million tonnes in 2050. There is a need to move towards a global trading system that is fair, more predictable and focused on food security and that contributes to a dependable market for food, thereby also creating a climate that creates incentives for investments in expanded production in developing countries.

Climate change represents a major source of risk for long-term food security. In particular countries in sub-Saharan Africa and South Asia may suffer the greatest share of damage in the form of declining yields and greater frequency of extreme weather events. Agriculture, forestry and fisheries will have to adapt to climate change, but can also help mitigate the effects of climate change, and useful synergies exist between adaptation and mitigation. There is a need for funding mechanisms that provide incentives for the adoption of sustainable farming practices and technologies and compensate governments and farmers for their contributions to reductions in greenhouse gas emissions.

Liquid biofuels based on agricultural commodities increased more than threefold from 2000 to 2008, by which date they accounted for about 10 percent of global coarse-grains utilization. Increased use of food crops for liquid biofuel production may offer new income opportunities for farmers but could have serious implications for food security. At the same time, bioenergy for meeting energy needs of rural populations offers interesting and less risky possibilities than large-scale liquid biofuel production to contribute to food security and poverty reduction. Policies promoting the use of food-based liquid biofuels need to be reconsidered with the aim of reducing competition between food and fuel for scarce resources, and the use of biomass-energy for improving rural people's access to sustainable energy should be promoted.

At the global level, governments need to work together to agree on common goals and coherent policies to achieve them, monitor progress, identify best practices and draw up contingency plans to be better prepared for future price spikes or other shocks to the global food system. Global governance of food security needs to be made more coherent and effective. There is urgent need for action towards establishing a Global Partnership for Agriculture, Food Security and Nutrition that has been called for at the recent high level fora, including G8 Summits and elsewhere, to improve coordination and coherence in international strategies and policies that have an impact on world food security. This includes in particular the ongoing reform process of the Committee on World Food Security (CFS) as the central component of the evolving Global Partnership, and the establishment of a mechanism to ensure sound scientific and technical analysis of food security and nutrition issues. The

reformed system should engage a broad range of stakeholders, foster partnerships and strengthen existing structures and institutions.

The world has the resources, technology and know-how to eradicate hunger now and for the foreseeable future, in spite of many challenges and risks. A number of countries are showing that, given strong commitment, rapid progress is possible. A prerequisite is to mobilize political will at the highest level and ensure that key decisions on investment and policies to eradicate hunger, as well as to forestall possible future food emergencies, are taken and implemented in a timely and effective manner.

As was correctly stated by the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), business-as-usual is no longer an option, if the world is to address the double challenge of (1) assuring access to adequate food for the more than one billion people who suffer from hunger and malnutrition today and of (2) increasing food supplies on a sustainable basis so as to meet the growing needs of the world's population over the next half-century. Solutions must be sought through full involvement of local people, effective use of local knowledge as well as modern science, and empowerment of local producers, traders and processors within an increasingly-integrated global economy. Policies to achieve food and nutrition security must include effective recognition of the right to food and ensure access to basic social services for every human being. They must give higher priority to increased public investments in agriculture and rural areas of developing countries, including the conservation of lands, water and biodiversity, so as to provide the poor and hungry, women and men alike, with better opportunities to find site-specific and sustainable solutions to the problems confronting them. Solutions must include fair and efficient market conditions, secure and affordable access to productive resources, land, water, seeds, knowledge and a broad range of technologies. Environmental services generated by the rural people should be adequately compensated. Higher productivity and resilience of production systems are essential for raising rural incomes, improving access to food for the poor, enabling local agriculture to compete better and mitigating the impact of climate change.

1. Introduction

The sharp increases in food prices that occurred in recent years, and the resulting increases in the number of hungry and malnourished people, have drawn attention to the fragility of the global food system and the vulnerability of food security. This awareness must be translated into effective action to render the system more resilient against various risk factors and to ensure that all of the world's growing population will have assured access to adequate food today and in the future. There is a need to address current and new challenges that transcend the traditional decision-making horizons of producers, consumers and policy-makers, both at national and global levels.

In the first half of this century, global demand for food, feed and fibre is expected to grow by 70 percent while, increasingly, crops may also be used for bio-energy and other industrial purposes. New and traditional demand will thus put growing pressure on already scarce agricultural resources. And while agriculture will be forced to compete for land and water with sprawling urban settlements, it will also be required to serve on other major fronts: adapting to and contributing to the mitigation of climate change, helping to preserve natural habitats and maintaining biodiversity.

At a time when more than one billion people are undernourished and thousands of young children die every day from diseases which they would survive under conditions of better nutrition, action to ensure adequate food supplies when world population nears its peak in mid-century must go hand in hand with immediate measures to provide today's hungry and needy people with opportunities to enjoy a life in adequate nutrition, health and dignity. Success in addressing the immediate problems of large-scale hunger and malnutrition will make the road to ensuring adequate food supplies in 2050 all the easier.

2. Outlook for food security towards 2050

2.1 The changing socio-economic environment

The changing socio-economic factors that drive increasing food demand are population growth, increasing urbanization and rising incomes.

According to the latest UN **population prospects** (median variant), the world population is projected to grow by 34 percent from 6.8 billion today to 9.1 billion in 2050 (or well below 1 percent per year). Nearly all of this increase in population will take place in the part of the world comprising today's developing countries, and a large part of it comes from assumptions of longer life expectancy. The greatest relative population increase, 120 percent, is expected in today's least developed countries.

By 2050 more than 70 percent of the world's population is expected to be urban.

Urbanization will bring with it changes in life styles and consumption patterns. In combination with income growth, it should accelerate the ongoing diversification of diets in developing countries. The shares of grains and other staple crops in diets will be declining, those of vegetables, fruits, edible oil, meat, dairy, and fish will increase. In response to rising demand for semi-processed or ready-to-eat foods, the whole structure of market chains is likely to move towards a further concentration of supermarket chains.

While the share of the urban population is growing, however, rural areas will still be home to the majority of the poor and hungry for quite some time. Living in hunger hot-spots, often ecologically fragile areas, many of them have to cope with conditions of high population pressure and deteriorating ecosystems. Despite urbanization, rural populations could grow faster than employment in primary agriculture, so governments should endeavour to create an institutional environment in rural areas that is conducive to multiple sources of employment and income, including the development of agro-industries.

Projections of the third key determinant of future demand expansion, **income growth**, are subject to greater uncertainty. In the years preceding the current global financial crisis of 2008/09, economic growth was particularly high in many developing regions, especially in Asia, but also in many countries of sub-Saharan Africa. The financial crisis has disrupted this growth. So far, analysts view that the longer-term effects of the financial and economic crisis on economic growth will be relatively small. The latest version of the World Bank's baseline projections of economic growth implies an average annual rate of GDP growth of 2.9 percent during the period between 2005 and 2050, breaking out into 1.6 percent for high-income countries and 5.2 percent for the developing countries.

The future **growth of food demand** will be the combined effect of slowing population growth, continuing strong income growth and urbanization in many of the developing countries and associated shifts in diet structures, and gradual food saturation in many developing countries, as is already the case in developed countries. Globally the growth rates of demand will clearly be lower than during preceding decades. Nevertheless, the projected total demand increase is still significant in absolute terms, with only small differences between the main models. By 2050, the global demand for food is projected to be 70 percent higher than today, involving an additional annual consumption of nearly 1 billion tonnes of cereals for food and feed and 200 million tonnes of meat.

Moreover, the future total demand for agricultural commodities may exceed the demand for food and feed more or less significantly, depending on the expansion of **demand for liquid biofuels** and on the technology used for the conversion of agricultural biomass into liquid biofuels.

How far future growth will be adequate to achieve food security will also be determined by the **prospects for poverty reduction**. In this context, it is encouraging to note that the secular decline of global poverty has intensified in recent decades. However progress has not been uniform and was interrupted during the current crisis.

2.2 The natural resource base to 2050 – will there be enough land, water and genetic diversity to meet demands?

The rate at which pressures are building up on natural resources – land, water, biodiversity – will be somewhat tempered during the coming 40 years due to the slowdown of growth in demand for food and feed. However, an expanded use of agricultural feedstock for liquid biofuels, ongoing environment degradation and a probable increase in the scale and frequency of weather shocks induced by climate change processes would work in the opposite direction.

Much of the **natural resource base** already in use worldwide shows worrying signs of degradation. According to the Millennium Ecosystem Assessment, 15 out of 24 ecosystem services examined are already being degraded or used unsustainably. Soil nutrient depletion, erosion, desertification, depletion of freshwater reserves and pollution of groundwater, overfishing, loss of tropical forest and of biodiversity are clear indicators. Urbanization is also diminishing the availability of land for food production.

The world still possesses **considerable reserves** of uncultivated land that is suitable for conversion to arable land. However, the extent to which this can be realized is limited. The absence of secure land tenure rights in developing countries with apparent reserves chokes investment. Additionally, some of the lands currently not cultivated have important ecological functions that would otherwise be forgone. Also, they are mostly located in just a few countries in Latin America and sub-Saharan Africa, where lack of access and infrastructure could limit their use at least in the short term. Taking these limitations into account, FAO projects that by 2050 the net increase of the arable land area will be just 70 million hectares, or about 5 percent of the current area.

The availability of **fresh-water reserves** for the required production growth shows a similar picture. At global scale, there are sufficient capacities, but these are very unevenly distributed. Irrigated agriculture covers one fifth of arable land and contributes nearly 50 percent of crop production. However, an increasing number of countries are reaching alarming levels of water scarcity and 1.4 billion people live in areas with declining ground-water levels. Water scarcity is particularly pronounced in Near East/North Africa and South Asia and is likely to worsen as a result of climate change in many regions. Opportunities for increasing overall water efficiencies are constrained by technical and institutional rigidities. Many of the large irrigated commands are reaching limits of their overall land productivity. Unreliable delivery of water supplies, salinization and water quality deterioration all conspire to attenuate productivity growth. Taken together with labour shortages, the prospects for maintaining levels of productivity in many small-scale and medium irrigation systems will need much closer attention to on-farm management and mechanization to reduce production risks and harvest losses.

Biodiversity, another essential resource for agriculture and food production, is threatened by urbanization, deforestation, pollution, overfishing, and the conversion of wetlands. The gene pool in agricultural plant and animal genetic resources and in the natural ecosystems that breeders need as options for future selection is diminishing rapidly. A dozen species of animals provide 90 percent of the animal protein consumed globally and just four crop species provide half of plant-based calories in the human diet.

The future of agriculture and the ability of the world food system to ensure food security for a growing world population are, therefore, closely tied to **reversing degradation of critical natural resource inputs**. The aim must be to stop over-exploitation, degradation and pollution, promote efficiency gains and expand overall capacities as appropriate. Adequate regulation and incentives are also needed to provide the rural population engaging in ecosystem services with win-win solutions to improve the sustainability of ecosystems, mitigate climate change and improve rural incomes.

FAO expects that globally 90 percent (80 percent in developing countries) of the growth in crop production will have to come from **intensification, in particular higher yields and increased cropping intensity**. Only 10 percent (20 percent in developing countries) would come from expansion of arable land. Similarly, yields from capture fisheries are widely recognised to be at their limits and any substantial increases in fish production will have to come from aquaculture. Realizing such a trend would be in line with past developments, but represents a major challenge for future private and public research, including research to identify appropriate technologies for intensive farming that are simple and less costly to adopt, much less damaging to the environment than those in current use and to create greater resilience in farming systems to changing patterns of risk.

Food losses represent a significant cost to the world economy and have a significant impact on our ability to feed the world. Losses contribute to high food prices by removing part of the supply from the market and also have an impact on environmental degradation and climate change in that land and non-renewable resources are used to produce, process, handle and transport food that no one consumes. Loss assessments are generally unreliable, but it is clear that there is a problem and that this needs to be addressed as a matter of urgency. It is essential to take a view of the entire chain rather than of individual stages. There can be significant losses at the time of harvest and in some cases crops are left unharvested for lack of an effective demand. For cereal crops, drying, threshing and milling can cause huge losses, while poor handling, packaging and transport of perishable fruits and vegetables can, on occasions, result in up to half the crop being wasted. There can also be losses during food

processing. All such food waste represents a waste of human labour, land use, water, fertilizer and other inputs, and of fuel for transportation, processing and cold storage.

2.3 Potential for food security

According to **FAO's baseline projections**, it should be possible, with adequate investments, to meet the future food and feed demand of the projected world population in 2050 within realistic rates for yield development, water-use efficiency and land expansion. Whether all people's needs for food are met will, as now, depend on the policies followed.

The **global average daily calorie availability** would rise to 3050 kcal per person, a 10 percent increase over its level in 2003/05. To achieve this, global cereal production would need to increase by 40 percent overall, or by nearly 1 billion tonnes. Much of the increase in cereals demand will be for animal feed to support the growing consumption of livestock products. Meat consumption per caput for example would rise from 41 kg at present to 52 kg in 2050 (from 30 to 44 kg in the developing countries).

The developing countries are projected to provide most of the projected consumption growth by **expanding their own production**. However, they will also increase their food imports significantly. For example, the developing countries' net imports of cereals are projected to more than double from 135 million tonnes in 2008/09 to 300 million tonnes in 2050. The developed countries will be able to increase their export potential accordingly. On their part, the developing countries will be growing net exporters of other food commodities like vegetable oils and sugar. Again, the advent of liquid biofuels has the potential of altering these prospects as all three commodity groups are used as liquid biofuel feedstocks.

Should this baseline perspective be realized by 2050, the level of per-caput **food availability will still vary widely among countries**, although it will be on average higher than today. Industrial countries would have average availability levels of nearly 3600 kcal/person/day; the developing countries as a group may reach almost 3000 kcal. These average amounts are well above the minimum daily needs.

The projected rather high average levels of food availability would imply that the **prevalence of chronic hunger** may recede considerably in most countries while problems related to over-nourishment and food wastage may become serious issues in more countries.

But unless there are major shifts in policies, **hunger will not disappear as a consequence of increases in average food availabilities**. Considering only the prospects for supply and demand for food and feed (as expressed in the market), and excluding any eventual growth in demand for liquid biofuels, the prevalence of chronic under-nourishment in developing countries would decline to about 5 percent of the population, or about 370 million people, by 2050. Sub-Saharan Africa as a whole would still be at 7 percent and some smaller countries could still have prevalence rates over 15 percent. For all people to be freed from hunger on a sustainable basis, extra efforts of public policy will be needed, including higher investments to generate opportunities for additional productive employment inside or outside agriculture, macro-economic reforms towards a more equitable distribution of assets and incomes, measures to curb excessive consumption and wastage, and targeted social safety nets.

It is obvious that the somewhat positive vision presented here contrasts strongly with the reality of recent trends. Even though food availability has been rising faster than population growth, **the number of chronically undernourished and malnourished people in the world has also been rising, not falling**. FAO estimates that the number of chronically undernourished people has risen from 842 million at the beginning of the 1990s to over one billion in 2009. The recent increase was mainly the consequence of the recent financial crisis

and the drastic food price increases and, paradoxically, occurred although global harvests had reached record levels.

Assuming that food output grows as projected, the above scenario suggests that there is ample room for moving towards a more equitable pattern of consumption, and gaining large health and environmental benefits. The task, however, would become more challenging in the face of a more intensive **competition between food and energy commodities** for limited land and water resources. As the recent crisis has demonstrated, a rise in oil prices can easily cause a further increase in the conversion of agricultural biomass into liquid biofuels. This can contribute significantly to price increases for agricultural inputs and in the food and feed markets, with a risk of additional food insecurity.

The continued existence of hunger and malnutrition on a vast scale in a world of plenty is unacceptable. It causes immense suffering and is a major cause of the huge gap in life expectancy between rich and poor. **Hunger and malnutrition also entail large economic costs**, severely compromising the productivity of individuals, including the learning ability and physical growth of children. When more than 20 or 30 percent of the population are chronically undernourished, as is the case in almost 40 countries, the growth of entire economies is held back. In developing countries, one in three children under the age of five is stunted due to chronic malnutrition, and 148 million children are underweight. Moreover, micronutrient malnutrition affects over 30 percent of the world's population – some 2 billion people - and is accompanied by serious physical incapacity, impairment, illness and diseases, including those related to excess consumption (overweight and obesity, heart disease, diabetes and stroke). The economic costs include direct costs of lost productivity and increased medical care, and indirect costs due to compromised cognitive and physical development, which greatly outweigh the costs of remedial action.

To conclude this outlook for food security on a positive note, it is recalled that a number of developing countries in all regions have made tackling hunger and malnutrition a priority and have shown that, **with strong commitment, rapid progress can be achieved in improving food security**. The common characteristics of their policies and strategies include political stability; good governance; strong economic growth promoting inclusion and opportunities to the poor population, primarily based on growth of agriculture; improvements in income distribution; twin-track food security strategies, combining productivity-enhancing investments with targeted social safety nets; and integration into world markets and/or strengthening internal markets. Successful policies also include special and targeted action to improve nutrition security, i.e. the quality component of foods produced and the nutrient composition and physiological adequacy of foods consumed.

3. Conditions for achieving global food security

Action is needed now to ensure that the required increase in food production is achieved, and that every human being has access to adequate food. This chapter outlines the main priority actions and concludes with estimates of investment needs and a brief review of the role of markets in enhancing food security.

3.1 Investing in sustainable agriculture and universal food access.

According to FAO estimates, total **average annual gross investment needed** in primary agriculture (soil fertility, farm machinery, livestock, etc) and in downstream sectors (storage, marketing and processing) in developing countries to deliver the required production increases would amount to USD 209 billion, at constant 2009 prices. Most of this total would consist of private investment. Additional public investment would be needed in agricultural research and development, rural infrastructure and social safety nets. These estimates exclude investments to meet an eventually increasing demand for feedstock for liquid biofuels.

Compared to these investment requirements, **current investment in developing countries' agriculture is clearly insufficient.** On average between 1997 and 2007, annual gross investments in primary agriculture at 2009 prices have been estimated at approximately USD 142 billion. To achieve the average annual requirements towards 2050, developing countries as a group need to raise annual total gross investments in primary agriculture and downstream services by about **47 percent**, with public investment rising in proportion.

There is empirical evidence that insufficient investment in agriculture of developing countries can have a severely **detrimental impact on food security.** Indeed, the agricultural capital stock per person active in agriculture has grown least in those countries with the highest prevalence and depth of hunger in particular in sub-Saharan Africa and South Asia.

The declining trend of **Official Development Assistance (ODA) for agriculture and rural development** should be reversed. It had dropped from 17 percent in 1980 to 3.8 percent in 2006 and now stands at around 5 percent. This decline is all the more striking because it happened in the face of rising hunger and rural poverty. ODA can enhance the effectiveness of public funding. Given the common purpose, public finance from domestic and from international sources should be made complementary through effective coordination and joint targeting, monitoring and accountability, in line with the Accra Agenda for Action and Paris Declaration.

Foreign Direct Investment (FDI) in agriculture, forestry and fishing has been less dynamic than FDI in other sectors. However, more recently, investors of different sizes and corporate structures have become active at all points in the global food value chain, from input supply, seed propagation, production on the farm, trading and logistics, processing and retailing. Foreign investors including states seem to be particularly interested in making direct investment in land through purchases or leasing arrangements. Developing countries need to improve their capacity to manage this process of foreign investment in land and processing industries with a view to maximizing national benefits from such investments and avoiding undesirable impacts on their own food security, poverty reduction, rural development, technology and access to resources, especially land. The possibility of an international Code of Conduct could be explored, to guarantee that benefits of such investments are shared in an equitable manner between developed and developing countries.

3.2 Conserving natural resources and enabling productivity growth

Since options for further expansion of the agricultural frontier are limited, most extra food produced will have to come from a rise in yields. However, in recent years, yield growth rates have slowed down notably in many countries and for major commodities. In particular, cereal yields growth rates have dropped from 3 to 5 percent per year in the 1960s to between 1 and 2 percent in the early 2000s.

Investment in **agricultural research and development (R&D) can generate very high rates of return.** Therefore, it is vitally important that investment in agricultural R&D, including aquaculture, in developing countries be significantly increased. The downward trend of R&D investments that has been observed in many developing countries should be reversed, and based on a much higher priority for agricultural research. Where countries have common issues, international cooperation in concrete R&D projects can provide significant scale economies. In particular, the CGIAR Centers and the National Agricultural Research Systems (NARS) need to be strengthened. In order to encourage private sector investment in breeding and seed systems, plant-breeding intellectual property rights need to be clearly defined.

In the past, yields have increased due to a combination of expanded use of seed of improved crop varieties and animal breeds, rising use of fertilizers and pesticides, mechanization and expansion of irrigated areas under better farm management and improved farmers' know-how. This **input-intensive agriculture** has generated a remarkable growth of supply and farm incomes. However, more efforts are needed to ensure its sustainability. Risks to be addressed include the narrowing of the genetic breadth of crops and livestock species, damages to soil structures, over-use and pollution of water resources, disruption of ecosystems and rising greenhouse gas emissions as fertilizer use, mechanical farm power and livestock expand.

The major challenge is to conserve, protect and enhance the productive capacity of the natural resource base on which agriculture depends and **develop farming and aquaculture systems that combine farmer's income growth with truly sustainable resource use**. Related to this is the need to rehabilitate traditional and indigenous food crops that have gradually been abandoned in many countries.

To minimize negative externalities and ensure usefulness for all stakeholders including smallholders and women, much of the necessary research and local adaptation will have to be undertaken by public sector institutions and farmers. Technologies must be adapted to the local needs of poor farmers and they must have access to them. Even at current levels of technology, large and economically exploitable yield gaps remain in many places. In sub-Saharan Africa, in particular, there are indications of yield gaps which could be exploited with existing varieties and with already established practices.

The **suite of technological options for farmers should be as broad as possible**, ranging from new plant varieties and animal breeds to farming systems with improved water- and labour-saving technologies, reduction of food losses and waste, to improved natural resource management. Technological advances are particularly needed in the staple crop sector. Preference should be given to technologies promising **win-win combinations** of enhancing productivity and conserving managing natural resources.

The main directions of investigation are likely to lie in looking at better ways of harnessing and stimulating natural biological processes for improving soil fertility and the management of pests and diseases. This can build, *inter alia*, on experiences in **improved conservation agriculture practices** in many parts of the world. The range of options also comprises **modern biotechnologies**, including transgenic crops. Biotechnology can potentially benefit the poor if and in so far as traits provide solutions on profitable terms to the location-specific needs of resource-poor farmers and of consumers. However, due to several concerns, the acceptability of transgenic crops continues to be controversial in many societies.

The technology challenge also extends to the **up- and downstream sectors**. Transforming developing economies in particular need research and extension services to ensure that traders, processors and distributors have access to a broad choice of technologies that are competitive and comply with food safety and quality standards.

New information and communication technologies offer new opportunities for technology transfer and knowledge sharing. Sharing knowledge, developing skills, transferring technology and building local management capacities in rural communities is a major challenge. In many countries, budgets for **extension services** have been cut and **public institutions** have been weakened or even dismantled, in others the knowledge base and extension services have been hard hit by a series of factors such as migration and HIV-AIDS. There is a need to strengthen traditional and indigenous knowledge systems and to transfer appropriate agricultural technology more effectively. In many developing countries, women form the majority of farmers and more efforts need to be made to factor the needs of women into dissemination and capacity development programmes. Other gender issues have an

impact on the agricultural sector such as the missing generation, which leaves the young and older generations to care for the agricultural production. All these groups require a wider range of approaches, including Farmer Field Schools, to cope with their livelihoods.

3.3 Broadening access to food

Countries that are enjoying significant rates of economic growth are well positioned to address the underlying, structural causes of hunger and malnutrition. They are faced with the options of investing in upgrading of infrastructure and services, thereby expanding production and employment opportunities, as well the possibility of introducing measures that lead to an increasingly equitable distribution of income.

For most countries, however, in the short term, primary options for ensuring that everyone can enjoy adequate access to food is to create **targeted social protection or safety net** programmes. These are usually based on assuring a level of income – through cash transfers, payment for labour on public works, or school meals – that close the gap between current food consumption levels and those needed for a healthy life. There is also likely to be a strong case for launching large-scale programmes aimed at ending micronutrient and vitamin deficiencies.

The main challenge is to verify with governments that they can afford these programmes and, once agreed, to put in place institutional arrangements that allow for accurate targeting and honest administration. Economic studies show that such programmes should not be considered as welfare but as viable investments that generate their own stream of economic benefits. This linkage that can be reinforced by the addition of conditions in cash transfer programmes, by which the help received by poor families is conditional on the observance of certain conditions related to health and education.

The **costs of Safety Nets** vary among countries, and depend on the form of assistance offered. One of the most comprehensive social programmes in Africa, Ethiopia's Productive Safety Net programme, benefits some 7 million people at a maximum cost of USD 3.50 per person per month or USD 21 for a maximum of 6 months per year. In Latin America, Brazil's Bolsa Familia cash transfer programme provides a monthly allowance of about USD 51 per family to more than 12.4 million families.

Assuming that 600 million people now suffering from hunger would be eligible for participation in social protection programmes, at an average cost of USD 40 per year, the annual cost would be about USD 24 billion. The total cost would fall progressively as people graduated from assistance, as a result of better ability to participate in the labour market.

To the extent that this additional income was spent on food, which is the case in most social protection and safety net programmes, it would be "recycled" through food markets, increasing demand for local food output. A positive externality can be reached if local small farmer production can be boosted to answer this increased demand.

The World Bank has estimated the costs of a programme to address micronutrient deficiencies in 68 countries at USD 11.8 billion per year.

3.4 Trade, markets and support to farmers

The recent world food crisis of 2007-2008 provided a clear reminder that the global food and agricultural system, including agricultural trade, is highly vulnerable. The **risks and uncertainties** associated with this vulnerability necessitate, *inter alia*, a reconsideration of the factors that drive long-term agricultural trade, including a possible reform of the global agricultural trade rules.

A number of factors seem to have gradually created a **situation of tightly balanced supply and demand**: growing world demand, especially in developing countries, for basic food as well as high value commodities; reduction of strategic food stocks over the past decades, especially in developing countries; slowing rates of productivity growth; rising energy prices and conversion of agricultural feedstock into liquid biofuels. Under such tightening conditions, it may take just a single shock such as a crop shortfall, commodity speculation or a short-term energy price increase to create a major price spike.

The **medium to long-term outlook for agricultural commodity prices** suggests that whereas overall demand growth is expected to slow further, demand for some income-sensitive products will grow faster, in particular in developing countries. Insufficient investment in productive capacity and the persistence of supply-side constraints to productivity growth in the developing countries keep supply response elasticity low and markets tight. Another factor which may keep prices firm in the medium term is further demand growth for liquid biofuels. Experts expect that food prices may stay above pre-2006 levels, at least in the medium term.

Several factors point to the **risk of growing volatility of global food commodity markets**. These include, in addition to normal production variability, speculation on the food market with derived products, the instability of the US dollar exchange rate, widespread macroeconomic instability, unstable oil prices and inward-looking unilateral policy reactions by countries to protect their own citizens, such as export bans in times of high prices.

In recent years, direct **price-distorting policies** have been gradually removed in many countries. This trend should continue. Many developing countries have improved price incentives for agricultural producers by reducing historical policy biases against agriculture. Low-income food-deficit countries need to reduce their vulnerability to international market shocks further, and this preferably not through erection of new trade barriers but through investment in productive capacity and risk management. While overall OECD support to farming has been stable over time, the relative weight of decoupled support in the overall transfers to agriculture has been gradually increased. The aggregate trade-distortion coefficient for OECD agricultural support declined from 0.96 in 1986 to 0.74 in 2007. There is a need to move further towards a global agricultural trading system that contributes to a dependable market, focuses on eliminating trade barriers and ensures that targeted safety mechanisms are in place to shield the most vulnerable.

As price spikes could become more frequent, the needs of **low-income import-dependent countries** have to be addressed. They need access to adequate food imports in situations of extraordinary scarcity on global markets. Arrangements could include suitable risk reduction and risk coping policies and/or a dedicated food import financing facility. Policies such as export bans and prohibitive export taxes should be avoided in such situations. Further reforms should concentrate in particular on the remaining market-access restrictions on agricultural imports. Backtracking on liberalization would reduce the ability of trade to stabilize markets and generate welfare, with negative consequences for food security.

New and innovative arrangements are needed to ensure that levels of **worldwide food stocks** are adequate and that poor and import-dependent countries have access to them, especially at times of extraordinary scarcity.

Strengthened **regional economic cooperation** should help to provide buffers for local economies in times of economic insecurity and stress. Such arrangements can also enforce capacity to deal with regulation through sanitary and phyto-sanitary standards, including food safety risk management, and enhance bargaining positions when countries need to purchase food and/or agricultural inputs in the international markets.

At the same time, considering the prevalence of hunger among the poor rural populations of the world, the productivity gap between smallholder farmers and the export-oriented agricultural sectors, and given that the recent rise in worldwide hunger is linked to insufficient income, it is important that assistance to family farmers includes access to markets. The Brazilian Food Acquisition Programme, a component of the Zero Hunger strategy, is an example of such action that benefits not only the farmers themselves, but may help revive economically depressed rural areas.

4. The risks and challenges

The ability of the global food and agricultural system to meet future demand for food, feed and fibre and to achieve food security could be severely affected by a number of risks and challenges. An increasingly worrisome challenge is climate change, affecting developing countries disproportionately. A second challenge is a rapid increase in the use of agricultural feedstock for liquid biofuels, causing additional scarcity on markets for food and feed and increased competition for factors of production including land and water.

Another issue of concern is that hunger and malnutrition may persist or even continue to rise in spite of food supplies being sufficient at aggregate levels.

4.1 Hunger amidst adequate overall supplies

During the recent decade global food production has generally followed a positive growth trend, even on a per caput basis. Nevertheless, the number of chronically undernourished people has grown, not fallen. This is a clear reminder that ensuring an adequate supply of food at the aggregate level, globally or nationally, does not guarantee that all people have enough to eat and that hunger will be eradicated. The task to be confronted today and in the immediate future is to avoid the risk that the trend of hunger continues to rise.

The immediate reasons why hunger and malnutrition may persist in the midst of adequate aggregate supplies at national or global levels are well known: lack of growth of the agriculture sector, lack of income opportunities for the poor and absence of effective social safety nets. Experience of countries that have succeeded in reducing hunger and malnutrition shows that economic growth as such does not automatically ensure success: **the source of growth and how the benefits are shared** also play key roles. In this sense, economic growth is an important condition but is not sufficient in itself. However, overall, GDP growth originating in agriculture, in particular rural smallholders, is, on average, at least twice as effective in benefiting the poorest of a country's population as growth generated in non-agricultural sectors. This is because 75 percent of the poor in developing countries live in rural areas and derive significant parts of their livelihoods from agriculture. Needless to add, measures to improve employment opportunities for the other 25 percent of the poor who live in the cities are equally important.

The second reason why hunger and malnutrition, including micronutrient deficiency, may persist in spite of adequate aggregate food supplies is the fact that millions of the most deeply poor and hungry are caught in a **vicious circle of hunger and poverty**. Experience has shown that hunger is often not only the result of poverty, but also its major cause. Poverty deprives people of the means both to buy and to produce food. Hungry people cannot work to their full potential and are more susceptible to disease. Malnourished children are unable to learn effectively. Many are handicapped for life. The vicious circle perpetuates itself when the malnourished child grows and is unable to guarantee the right to food of his/her children. Thus, fighting hunger today is also necessary to guarantee food security in the future.

For these people to escape from the vicious circle requires targeted and deliberate action in the form of comprehensive social services, including food assistance, health and sanitation,

education and training. A special focus on the most vulnerable, in particular women, children, and the elderly, is warranted.

There is a pressing need to find ways to ensure access to food for the world's one billion hungry today. Countries are advised to engage in **twin-track food security strategies** that aim to invest in productivity and employment enhancing growth, focusing in particular on the smallholder, women and the poor (track 1), and establish effective social safety nets and social protection programmes for the needy who cannot immediately help themselves (track 2). These two tracks can be mutually reinforcing as safety nets that translate un-met food needs into demand that can stimulate growth in agriculture, and as social protection programmes that can be directed towards the improvement of rural infrastructure and the provision of environmental services through targeted labour-intensive employment programmes.

The basic task is thus to give proper priority to short-term and long-term hunger eradication and to turn agricultural production growth into broadened access to food.

4.2 Climate change

Climate change will **affect agriculture, forestry, fisheries and aquaculture** through higher temperatures, elevated carbon dioxide (CO₂) concentration, precipitation changes, lower water availability and increased weeds, pests and disease pressure. Global mean surface temperature is projected to rise in a range from 1.8°C to 4.0°C by 2100. Such changes will have more or less severe impacts on all components of food security – production and availability, stability of food supplies, access to food and food utilization (safety).

At the current state of knowledge and in view of the wide consensus among scientists that climate change is already ongoing, climate change is more than a risk. It is a **priority to take effective action** both to mitigate its effects and to adapt to its consequences.

The impact of climate change on crop and fish production is projected to be **geographically very unevenly distributed**. Although the developing countries and, particularly, Small Island Developing States (SIDS), contribute less to climate change, they are expected to suffer the greatest damage through declining yields and greater frequency of droughts and floods. It has been estimated that the negative impact on African agricultural output up to the 2080-2100 period could be between 15 and 30 percent, whereas in the Northern hemisphere higher temperatures will allow an expansion of areas potentially suitable for cropping, longer growing periods and higher crop yields. Thus, while the aggregate effect of climate change on global production may initially be rather small, especially for cereals, it is likely to have an immediate and severe impact on food security on the Southern hemisphere, where food supply could be significantly below current, already insufficient, levels. In addition, the effect of increased demand for irrigation water could be enormous.

All current quantitative assessments show that **climate change will adversely affect food security**. On average, food prices are expected to rise due to climate change. The dependence of developing countries on food imports will increase. However, success in assuring food security in rural communities will greatly enhance their resilience to shocks induced by climate change. Vulnerable low-income countries need special assistance in improving disaster preparedness and resilience against disaster risk caused by extreme weather events

While agriculture currently contributes about 13.5 percent to greenhouse gas emissions (6.8 Gt of CO₂), it has an important mitigation role by storing carbon. It has the potential to mitigate between 5.5 and 6 Gt of CO₂ per year by 2030, mainly through soil carbon sequestration. Additionally, several agriculture-based mitigation options can generate significant co-benefits for both food security and climate change adaptation. More energy-

efficient fishing methods and reduction of overcapacity in the fishery sector can also contribute to the mitigation options. There is scope for **synergies of adaptation and mitigation in agriculture** through conservation agriculture, rehabilitation of degraded pastures and sustainable livestock production, forest conservation, agro-forestry for food or energy, land restoration, recovery of biogas and waste, responsible fisheries and aquaculture and, in general, a wide set of strategies that promote the conservation of soil and water resources by improving their quality, availability and efficiency of use. Vulnerable low-income countries need special assistance in improving disaster preparedness and resilience against disaster risk caused by extreme weather events.

Developing countries can generate multiple benefits through broader involvement in carbon markets. Particular efforts should be made to include agriculture in the forthcoming **Copenhagen agreement on climate change**. Carbon offsets in developed countries could be used to promote carbon emission reduction but at the same time to enhance productivity and production through agricultural technologies and investments in developing countries.

4.3 Bioenergy

An estimated 2-3 billion people rely on unsustainable biomass-based energy resources and 1.6 billion people, mostly rural poor, lack access to sustainable energy services. This situation entrenches mass poverty and food insecurity. National policies and programmes aimed at providing broader access to energy services for the rural poor will significantly contribute to sustainable development and achievement of the Millennium Development Goals. This can be supported through the design and implementation of livelihood-oriented gender sensitive small-scale bioenergy schemes.

Bioenergy development also brings new investment into the agricultural sector, which can provide market and employment opportunities for the 2.5 billion people dependent upon agriculture, which includes most of the 900 million rural poor. Bioenergy growth, if managed appropriately, can also contribute to improving infrastructure and market access in rural areas.

Liquid biofuel production based on agricultural commodities **increased more than threefold** from 2000 to 2008. In some countries, various policy measures promoting the rush to liquid biofuels, such as mandated blending of liquid biofuels with fossil fuels and subsidies, as well as tax incentives and import restrictions, have driven this development. The rapid rise of crude oil prices in the years up to 2008 has created an additional incentive. The drastic increases in prices of key food commodities such as maize, wheat, rice and soybeans in 2007/2008 mirrored the increase in prices of energy products and confirmed that energy and agricultural markets have become more closely linked.

A further rise in the production of liquid biofuels, particularly from food commodities, could create a real **risk for food security**, if not appropriately addressed. Already in 2007/2008 the total usage of coarse grains for the production of ethanol amounted to 110 million tonnes, out of a total utilization of 1120 million tonnes, hence a significant share of roughly 10 percent. According to OECD-FAO projections, global liquid biofuel production may roughly double to reach 192 billion litres in 2018, depending *inter alia* on the future price of crude oils and on support policies in major countries. Accordingly, the demand for agricultural feedstocks (sugar, maize, oilseeds) for liquid biofuels may continue to grow, putting upward pressure on food prices - and this in spite of the emerging concern that, on balance, some types of liquid biofuel may not result in significant reductions of greenhouse gas emissions. A recent IFPRI study estimates that continued rapid expansion of biofuel production up to 2050 could lead to the numbers of undernourished pre-school children in Africa and South Asia being respectively 3 million and 1.7 million higher than would have been otherwise the case.

Therefore, efforts need to be made to **reduce the competition between food and fuel for scarce resources**. Such efforts could include acceleration of progress towards non-food based second generation liquid biofuels, more integrated food-energy systems and reconsideration of current support policies such as subsidies and mandated blending. As it is recognized that non-food biomass feedstocks for liquid biofuels will still compete with food for limited resources, more efforts should also be made to develop alternative types of renewable energy and to promote energy-use efficiency both at household and at industry levels. In summary, future biofuel development should pay due consideration to the need to achieve and maintain global food security.

Trade impediments notwithstanding, the demand for biofuels can also be an **opportunity** for countries with adequate infrastructure and abundant land and climate resources, for example, in Latin America, South-East Asia and sub-Saharan Africa. If those opportunities are made accessible to poor smallholders through appropriate infrastructure investments, higher demand for biofuels could contribute to agricultural and rural development and food security.

5. Mobilizing political will and building institutions

The World Food Summit (WFS) in 1996 raised awareness of the enormous dimensions of hunger and malnutrition in the world. It also provided a useful framework for action. In the meantime, various countries have demonstrated political will by taking successful action to reduce the prevalence of hunger and malnutrition. However, **the stagnating or even rising global number of hungry and malnourished people in the world** is evidence that other countries either did not succeed although efforts were made, or did not even seek to take the required action.

Food security is central to poverty reduction, good health, better education, social inclusion, sustainable development, peace and security. At a time when there is enough food in the world for all, the existence of hunger and malnutrition is not only ethically unacceptable but also economically costly. Where it results from negligence or ignorance by responsible policy-makers, it is also a **violation of people's basic human right to adequate food** and to a life in good health and dignity.

The time has come to start a major new campaign to **mobilize political will** by urging all responsible actors to address the root and multifaceted causes of food insecurity, and translating the political will into concrete action, guaranteeing the resources necessary to promote food security and invest in agriculture. Such mobilization could be sought at different levels, including national dialogues on food security and global governance of food security.

National dialogues on food security should be held in countries concerned with hunger and malnutrition, involving governments and a broad representation of civil society and, as appropriate, international development partners and other relevant stakeholders. The aim would be to clarify the significant political, social and economic gains to be obtained from reduction of hunger and malnutrition. The aim would also be to draw the attention of governments to their obligations under the UN Charter to respect, protect and fulfil human rights, including the right to food. Such national dialogues should ensure that the resulting policy agenda for food security reflects national and local conditions, is adequately funded from national and complementary international sources and contains the most appropriate instruments. An adequate mix of measures is important, on the one hand to expand future income earning opportunities and productive capacity, in particular for lower income groups, and on the other hand to provide the neediest and most vulnerable with immediate access to adequate social services, in particular food and health.

An important step in a global campaign for political will is **raising popular awareness and understanding throughout the world** about the problems of hunger and malnutrition and the realistic solutions. Such awareness is necessary to enable societies and concerned actors to express their support for serious policy action. Unless governments feel such broad support, they may continue to be hesitant about committing themselves to the required major policy reforms and changes in budget allocations, in view of the resistance by those who would benefit from continuation of business-as-usual.

Two preconditions for an effective and sustainable mobilization of political will are important: first, the national dialogues must take place within a broad-based **country-led process** resulting in a concrete business plan for national food security, involving national stakeholders and development partners in the preparation and based on principles of good governance, human rights and economic efficiency; second, a mechanism must be established that ensures **accountability** of the government and its national and international partners for implementation and follow-up of the plan. To confirm their willingness to be held accountable for concrete action in pursuit of a stated goal of hunger reduction, governments could be invited to express their commitment through some form of official declaration to be registered in an appropriate manner. Such a registry of commitments would also be in the interest of transparency for all national and international partners.

Global governance of food security needs to be made more coherent and effective. The persistence of massive hunger and malnutrition in the world signals weaknesses in the current systems and a need for reform and improvement. Renewed political attention has been given to world food security and its governance with the intention to address both the effects of crises, but more importantly, the long-term, structural factors that contribute to hunger, food insecurity and malnutrition. There is an urgent need for action towards establishing a Global Partnership for Agriculture, Food Security and Nutrition that has been called for at recent high level fora, including G8 and G20 Summits and FAO governing bodies' meetings, to improve coordination and coherence in international strategies, policies and actions that have an impact on world food security. This includes in particular the ongoing reform process of the Committee on World Food Security (CFS) as the central component of the evolving Global Partnership. The CFS was created in 1974 following the World Food Conference to serve as the inter-governmental body within the UN system to review and follow-up policies and programmes concerning world food security, and was tasked in 1996 by the World Food Summit with the responsibility to monitor the implementation of the WFS Plan of Action. As an intergovernmental body, the CFS is universal in composition. It is open to all Member Nations of FAO and Member States of the United Nations and to representatives of other international organizations, NGOs, civil society and the private sector.

The most recent and promising initiative to strengthen coordination and partnerships to combat hunger and food and nutrition insecurity is the reform CFS. The reform package, which was approved by CFS members on 17 October 2009, aims to make CFS “... *a central component of the evolving Global Partnership for Agriculture, Food Security and Nutrition [that will constitute] the foremost inclusive international and intergovernmental platform for a broad range of committed stakeholders to work together in a coordinated manner and in support of country-led processes towards the elimination of hunger and ensuring food security and nutrition for all human beings.*”

To achieve food security, **good governance at national levels** is also essential. This extends to providing essential public goods, including political stability, rule of law, respect for human rights, control of corruption and government effectiveness. Realization of the right to food can add value to an effective food-security strategy by ensuring transparent policy

processes, accountability of public institutions and clarification of government obligations and of rights and obligations of rights-holders. Effective institutions are a particular feature of good governance. Priority will need to be given to institutional reforms that ensure that all members of society, rural and urban, men and women, producers and consumers throughout the food chain, including the vulnerable and food-insecure, are adequately organized and represented in the policy process.

The world has the resources, technology and know-how to eradicate hunger now and for the foreseeable future, in spite of many challenges and risks. A number of countries are showing that, given strong commitment, rapid progress is possible. A prerequisite is to mobilize political will at the highest level and ensure that key decisions on investment and policies to eradicate hunger, as well as to forestall possible future food emergencies, are taken and implemented in a timely and effective way. The needed resources must be made effectively available. The time to act is now, ensuring that each and every country that commits itself to the global goal of eradication of hunger and malnutrition translates this into national strategies and plans and holds itself accountable for playing its full part in creating a better future for all humanity.

