

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.