

Summary chapter 4

Sustainable food and nutrition security

Chapter 4 discusses current trends in food and nutrition security, explores immediate and long-term challenges, and presents the case for why agriculture is central to improving nutrition. Although both undernutrition as well as over-nutrition are discussed, the focus is on developing countries where food insecurity and malnutrition are most pronounced.

With an estimated increase of 105 million undernourished people in 2009 alone, the most recent projections from FAO put the number of individuals suffering from hunger at 1.02 billion, one in six of all humanity. The proportion of undernourished people in the world began increasing in 2004, three years before the food and financial crises starting in 2007. Thus the crisis did not create the current situation but rather significantly worsened an already existing problem. Each of the global downturn's symptoms – soaring food prices, reduced remittance streams, contractions in trade, and reductions in capital flows and overseas development assistance – have had and are continuing to have an impact on household purchasing power and welfare. Soaring food prices affect poor consumers directly by reducing the amount of food they can purchase; reduced remittance streams reduce the amount of money households can count on receiving; and contractions in trade and foreign direct investment have trickle-down effects that affect households through, for example, reduced government funding for health and social assistance, further increasing the risks of food insecurity and malnutrition in already vulnerable areas.

To cope with these challenges, many households have been forced to reduce the quality of the food they eat. When households replace animal-source foods, fruits, vegetables and other micronutrient-rich foods with cheaper high carbohydrate staples, total energy intake may remain above the minimum requirement, but micronutrient intake is likely to be compromised, increasing risk of malnutrition and associated poor health outcomes. When families are forced to reduce meal frequency and total quantity of food consumed, risk increases further.

In many developing countries, trends in undernourishment are complicated by the nutrition transition, characterized by a shift away from traditional diets towards a more globalized intake pattern that includes increased quantities of processed foods, animal products, sugars, fats and (sometimes) alcohol. For many countries in the middle stages of nutrition transition, continued high rates of food insecurity and undernourishment, combined with increased prevalence of overweight and associated noncommunicable diseases, are resulting in a “double burden” of malnutrition. However, not all nutrition transition effects are negative. Increased consumption of total energy and of animal-source foods are positive trends for food insecure populations with monotonous diets.

Agriculture plays a key role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy, and is thus central to improving food and nutrition security. Ways in which agriculture can sustainably contribute to improving dietary diversity and nutrition outcomes include support for: agricultural extension services that offer communities information and improved inputs such as seed and cultivars for better crop diversity and biodiversity; integrated agro-forestry systems that reduce deforestation and promote harvesting of nutrient-rich forest products; aquaculture and small livestock ventures that include indigenous as well as farmed species; education and social marketing strategies that strengthen local food systems and promote cultivation and consumption of local micronutrient rich foods; biofortification via research and development programmes that breed plants and livestock selectively to enhance nutritional quality; and reduction of post-harvest losses via improved handling, preservation, storage, preparation and processing techniques.

Creating an enabling environment to fight hunger and malnutrition requires addressing environmental, socio-economic, health, demographic and political challenges, including climate change, demand for biofuel, gender inequity, prevalence of HIV and other infectious diseases, population growth, urbanization, and political instability. Climate change can affect food and nutrition security

through reduction of income from animal production, reduction of yields of food and cash crops, lowered forest productivity, changes in aquatic populations, and increased incidence of infectious disease. Demand for biofuel may divert land away from food cropping and increase risk of harmful production practices and environmental degradation. Reducing gender inequity is an important part of the solution to global hunger. Close associations exist between improved household welfare and empowering women in terms of asset control, education and political participation. Within the agricultural sector, marginalization of female farmers inhibits their economic and political empowerment and is a serious constraint to improved food and nutrition security.

The continued high prevalence of HIV, malaria and other diseases worsen food and nutrition insecurity. At the individual level, the disease impairs absorption of essential nutrients and increases nutritional requirements. At household level, HIV can decrease purchasing power as a result of sickness, absenteeism, the inability to do work, and unemployment, as well as the increased time and money spent on treatment and care.

Population growth drives increased demand for food in terms of both domestic production and imports. The global population grew from around 2 billion in 1950 to just over 6 billion in 2009, and is projected to reach 9 billion in 2050. The proportion of the global population living in urban areas surpassed the population living in rural areas in 2009, and projections are that by 2050 the majority of the global population will be living in the urban areas of developing countries. For the urban poor, low incomes and subsequent inability to access adequate supplies of safe and nutritious food threaten food and nutrition security. Volatile food prices and rising unemployment exacerbate the problem.

Political instability is one of the most common and persistent challenges to food security. Conflict disrupts or prevents agricultural production, transportation and market access, and creates large populations of refugees and internally displaced persons who make heavy demands on local and national food supplies.

Improving the capacity of smallholder production systems should be a primary goal in efforts to overcome these challenges. However, while many of the world's poorest people are smallholders, and while in a number of developing countries domestic food production occurs predominately through small-scale farming, promoting food and nutrition security requires looking beyond smallholders to other vulnerable demographics such as landless labourers and the

urban poor. Provision of livelihood support, creation of social safety-nets and an explicit focus on maternal and child health are essential to improving the food and nutrition security of all these groups. At the policy level, making improved nutrition outcomes central to national development, protecting and expanding smallholder rights, increasing incentives to produce and market micronutrient-rich foods, prioritizing the needs of poor net consumers, and mainstreaming food and nutrition security concerns into policy frameworks and development agendas increase programme efficacy as well as chances for scaling-up. Regional and international policies, regulatory frameworks and agreements should support standard-setting initiatives that promote food and nutrition security within a global context.

Solutions to the challenges to food and nutrition security are complex and not the responsibility of agriculture alone. Nevertheless agriculture plays a crucial role in mitigating each challenge. Some of the most important emerging themes for nutrition-friendly agriculture, essential as part of a broader nutrition-sensitive development framework, include:

Pro-poor food production systems: Providing direct support to rural smallholder production and urban and periurban food systems to expand, enhance and sustain people's ability to procure and use the amount and variety of food required to be active and healthy.

Environmental sustainability: Improving agricultural production practices to address environmental concerns such as biodiversity, sustainable use of resources, and livestock sector reform.

Community-based capacity building to improve nutrition: Strengthening local food systems and promoting education and social marketing efforts that encourage balanced diets.

Setting higher standards in foreign direct investment: Developing regulatory frameworks to promote responsible foreign direct investment in agriculture and in food production, processing and marketing, in order to improve food and nutrition security, either directly through higher quality local food sources or indirectly via increased purchasing power.

In conclusion, agriculture is fundamental to reducing global hunger and, along with the health and care-based approaches discussed in other chapters of this report, is integral to improving nutrition outcomes worldwide.

Chapter 4

Sustainable food and nutrition security

THE CURRENT FOOD AND NUTRITION SECURITY SITUATION

With an estimated increase of 105 million undernourished people in 2009 alone, FAO projects that approximately 925 million individuals are currently hungry in 2010. Although this number is down from the 1.02 billion estimate made during the aftermath of the food and financial crises (Figure 21), it remains shockingly high. This means that almost one in six people are still not getting enough to eat on a daily basis (FAO, 2010a).

As shown in figure 22, the highest prevalence of undernourishment, one in three persons, is in sub-Saharan Africa. The greatest absolute number of undernourishment is in Asia and the Pacific (578 million), followed by sub-Saharan Africa (239 million), Latin America and the Caribbean (53 million) and the Near East and north Africa (37 million) (FAO, 2010a).

A total of 28 countries (19 of them in Africa) are moving in the right direction to achieve the hunger indicator for Millennium Development Goal 1²⁶, but current rates of progress are insufficient to meet the 2015 target (FAO, 2009b). Eighteen countries, mostly in Africa, have levels of hunger that are worse than they were in 1990 (UNICEF, 2009).

26 Eradicate extreme poverty and hunger by 2015. The associated Target 1.C is: Halve, between 1990 and 2015, the proportion of people who suffer from hunger (indicator 1.9 Proportion of population below minimum level of dietary energy consumption).

Figure 21. Number of undernourished people in the world, 1969-1971 to 2010

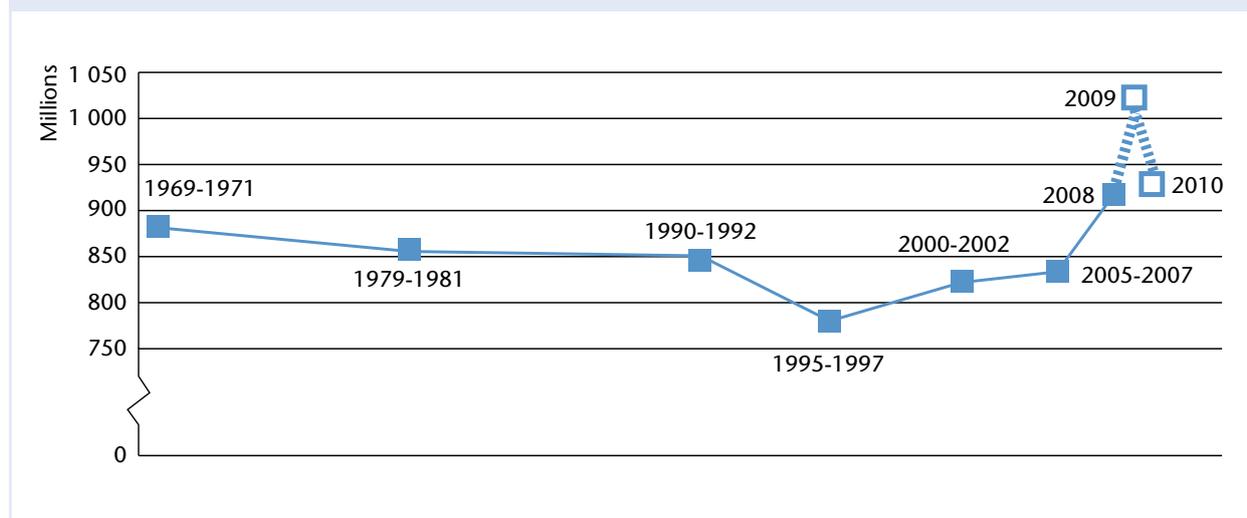
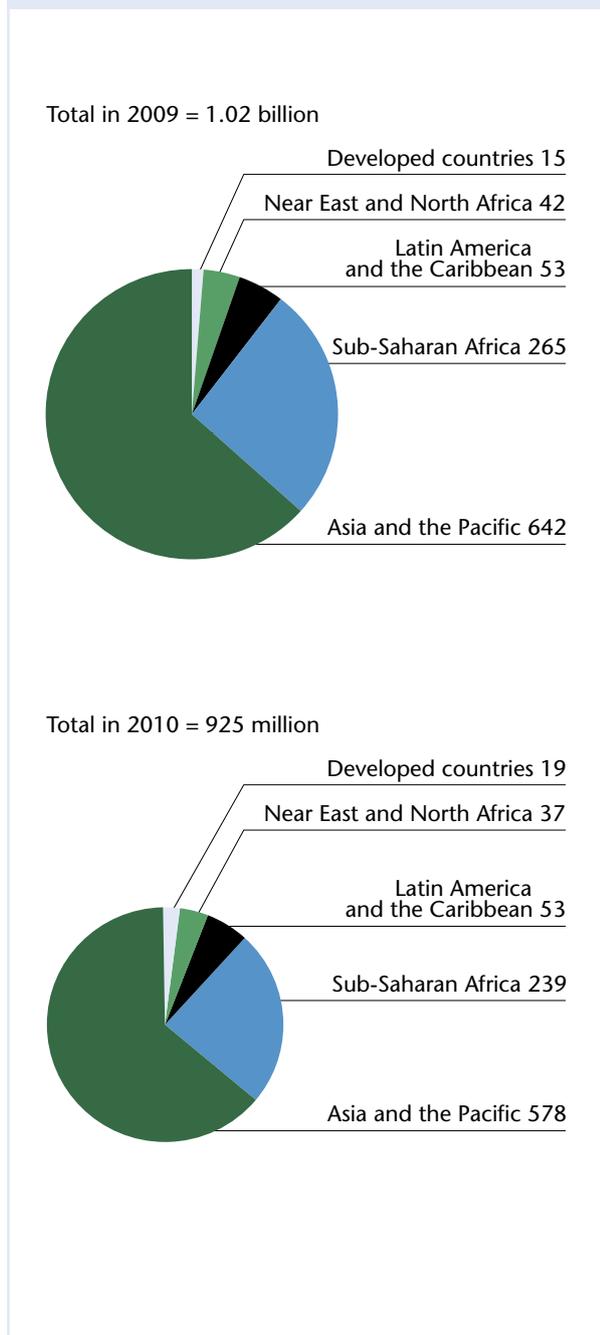


Figure 22. Undernourishment in 2009 and 2010, by region (millions of people)



Source: FAO

Effects of the global economic downturn on food and nutrition security

Although the proportion of undernourished people declined between 1969 and 1971, the trend reversed between 2004 and 2006, and thereafter began to rise, as shown in Figure 23 (FAO, 2010a).²⁷

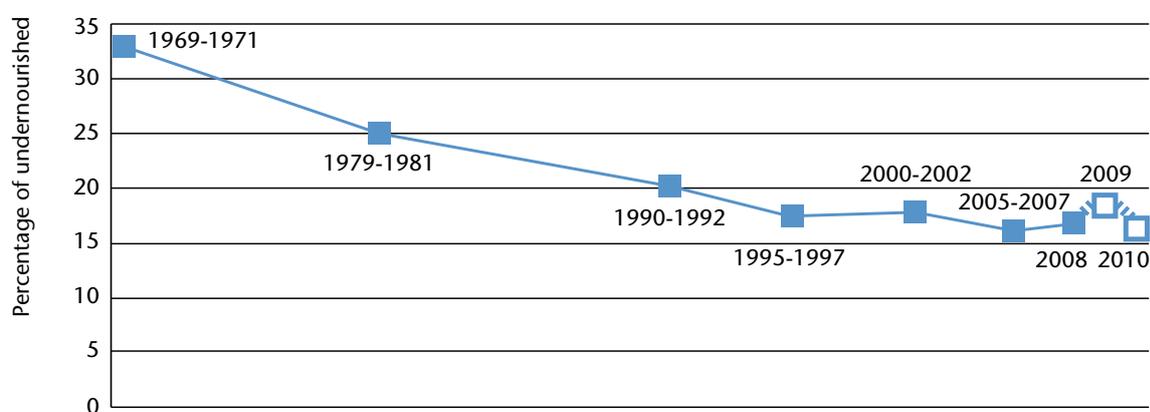
This trend continued through 2009 and shows that progress towards achieving the World Food Summit hunger reduction target and MDG 1 faltered prior to the recent food and financial crises. Food and nutrition insecurity were on the rise before 2008. Thus the impacts of the global downturn – soaring food prices, reduced remittance streams, contractions in trade, accelerated reductions in foreign direct investment and decreased official development assistance – on developing countries did not create the current situation, but rather significantly worsened an already existing problem.

The sections below explain how impacts of the global downturn exacerbated food and nutrition insecurity (see Box 1 for definitions of the terms used here), and discuss the harmful coping mechanisms that many households have had to engage in as a result.

Although global prices for food commodities have decreased since their peak in 2008, they are still high by historical standards. Moreover, prices on local markets have not fallen nearly as sharply as international food prices, because of lags in price transmission from global to domestic markets. For example, in June 2009, domestic staple foods cost, on average, 22% more in real terms than in June 2007 (FAO, 2009c). An FAO analysis in July 2009 showed that domestic prices in 58 developing countries remained “generally very high” and in some cases were at record levels (FAO, 2009d). Out of the 780 domestic price quotations for all the food

²⁷ FAO estimates that a total of 925 million people are undernourished in 2010 compared with the 1.023 billion statistic of 2009. This decline is largely attributable to a more favourable economic environment in developing countries and the fall in both international and domestic food prices since 2008. However, the 2010 estimate is still higher than those made before the food and economic crises of 2008-2009. Moreover, the recent increase in food prices, if it persists, will create additional obstacles in the fight to further reduce hunger. The fact that nearly a billion people are still hungry even after the recent food and financial crises have largely passed indicates a deeper structural problem that threatens the ability to achieve internationally agreed goals on hunger reduction, and supports the relevance of the coping mechanisms discussed in this section.

Figure 23.
Trend in the proportion of undernourished people in developing countries



commodities included in the analysis, the July 2009 quotations were the same or higher than in the pre-food price crisis period in 94% of the cases (FAO, 2009c)⁴. Although the cost of purchasing food on the international market place for least developed countries is expected to fall, it is projected the decrease will be less than 25% of what it was last year (FAO, 2009d). The deteriorating economic environment in which the decrease is taking place is, however, likely to outweigh much of the benefit (FAO, 2009e). For individuals, these effects of the economic downturn will lead to a considerable reduction in purchasing power and subsequent decrease in food and nutrition security, especially for net food buyers, who may spend up to 80% of their income on food. These consumers currently constitute a large portion of the population in many parts of the world. For example, FAO data from nine developing countries²⁸ show that about three-quarters of rural households and 97% of urban households are net food buyers (FAO, 2008a).

Decreased purchasing power caused by high food prices has been compounded by reduced remittance streams. In many developing countries, a large proportion of households rely on remittances for income. For example, in Egypt, Ethiopia and Senegal, remittances accounted for between 5 and 10% of GDP in 2009 (FAO, 2009b). The figure jumped to 25% in Honduras and 46% in Tajikistan (FAO, 2009b). The multiplier effects that remittances have on the local economy through increased demand for goods and services have also been reduced, further decreasing purchasing power and subsequent food and nutrition security.

Trickle down effects from contractions in trade and reductions in foreign direct investment also affect individual purchasing power and local economies, and thus affect household food and nutrition security (Horton et al., 2010). Global decreased demand for exports in 2009 was especially damaging for developing economies that are export driven (FAO, 2009b). Reduced export earnings further constricted already tight government budgets and decrease funding for health and social protection programmes, which for many households are crucial to food and nutrition security. For rural households, the drop in demand for agricultural exports has decreased purchasing power through reduced prices and quantities of goods sold. In urban as well as rural areas, lay-offs and other ripple effects may have further reduced incomes and hence the ability to purchase food. Market instability has also increased risk premiums for loans at international and national levels (FAO, 2009b). In terms of purchasing power and subsequent food and nutrition security, this translated to reduced credit at district and household levels. For example, microfinance institutions, often the only source of liquidity for women and other vulnerable groups, have been experienced difficulties in procuring sufficient funds because of bank rationing (FAO, 2009b).

For countries most vulnerable to poverty and food and nutrition insecurity, reductions in official development assistance are of particular significance. Foreign aid is the principal source of capital inflows for many of the world's poorest countries and constitutes a significant proportion of GDP in much of sub-Saharan Africa, for example 40%

²⁸ Albania, Bangladesh, Ghana, Guatemala, Malawi, Nicaragua, Pakistan, Tajikistan, Viet Nam.

Box 1**Key definitions and use of terminology in this report**

- **Food security** exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern (FAO, 2009b)².
- **Food insecurity** exists when people do not have adequate physical, social or economic access to food as defined above (FAO, 2009b).
- **Nutrition security** exists when food security is combined with a sanitary environment, adequate health services, and proper care and feeding practices to ensure a healthy life for all household members. This chapter refers to food and nutrition security throughout, because achieving nutrition security is imperative to reducing malnutrition (Shakir, 2006a).
- **Undernourishment** measures aspects of food security and exists when energy intake is below the minimum dietary energy requirement, which is the amount of energy needed for light activity and a minimum acceptable weight for attained height (FAO, 2009b)². Although undernourishment is based on national level data, it may be used as a proxy for food consumption in contexts where regional or household level data are unavailable or unreliable. It varies by country and from year to year, depending on the gender and age structure of the population. Throughout this chapter, the words “hunger” and “undernourishment” are used interchangeably.
- **Undernutrition** exists when insufficient food intake and repeated infections result in one or more of the following: underweight for age, short for age (stunted), thin for height (wasted), and functionally deficient in vitamins and/or minerals (micronutrient malnutrition).
- **Malnutrition** is a broad term that refers to all forms of poor nutrition. Malnutrition is caused by a complex array of factors including dietary inadequacy (deficiencies, excesses or imbalances in energy, protein and micronutrients), infections and socio-cultural factors. Malnutrition includes undernutrition as well as overweight and obesity (Shakir, 2006a).

in both Burundi and Liberia (FAO, 2009b). Since official development assistance decreases when donor GDP decreases, and since the recession was global, 2009 has been marked by decreased development assistance. International Monetary Fund projections for 2009 predicted an overall drop in official development assistance of approximately 25% for the poorest 71 countries in the world (IMF, 2009). Even before the downturn, the share of official development assistance going to agriculture was decreasing, down to approximately 4% in 2006 compared to 15% in 1979 (FAO, 2009f). Taken together, overall reductions in official development assistance and decreased investment in the agricultural sector have increased and will continue to increase the risk of food insecurity and malnutrition in already vulnerable areas.

Coping mechanisms

Volatile food prices, reduced remittance streams, contractions in trade, and reductions in foreign direct investment and official development assistance all contribute to reductions in purchasing power. To cope with declining incomes, many households have been forced to change their consumption patterns and reduce expenditures on health, education and goods, and some have been forced to resort to extreme strategies, such as street begging, prostitution and child labour, to maintain access to food. Many have reduced expenditures on food with consequent declines in the quality and quantity of their food intake. Although the impact varies according to context-specific variables (e.g. degree of price transmission, access to safe water, transport and handling costs, consumer preferences) these coping mechanisms generally increase risk of malnutrition both of micronutrient deficiencies and, in severe cases, of overall energy deficiency.

Shifting from a varied diet rich in micronutrients to one that is derived predominantly from starchy staples is a common response to declines in income. In five country case studies (FAO, 2009b) of the effects of the global downturn on food and nutrition security, Food and Agricultural Organization of the United Nations and World Food Programme cited dietary changes as the primary coping mechanism in each country.²⁹ Most staple foods (e.g. rice, maize, cassava) are much cheaper than fruits, vegetables and animal source foods. However, when eaten on their own or with very small amounts of other foods, the result is a poor-quality monotonous diet that is likely to be nutritionally inadequate in proteins, fats and micronutrients. This is because while staples are high in carbohydrates they are typically low or very low in lipids, protein, vitamins and minerals. For example, cassava root, one of the cheapest and hence most popular staple foods in much of sub-Saharan Africa, is particularly low in protein, with 0.8 g protein/100 edible grams (Wargiono, Richana & Hidajat, 2002) compared to 6.4 g for rice, and 9 g for both maize and wheat (FAO, 1972). Demand for cassava increased among many cash-strapped households in sub-Saharan Africa in 2008 (FAO, 2009b; FAO, 2009g).

When households replace animal source foods, fruits, vegetables and other micronutrient-rich foods with high carbohydrate staples, their energy intake may remain above the minimum requirement, but both macro and micronutrient intake is compromised, thus increasing risk of malnutrition and associated poor health outcomes. For instance, vitamin A deficiency and iron deficiency anaemia – two of the most common nutritional deficiencies – are caused by diets low in animal source foods, fruits and vegetables³⁰. Vitamin A deficiency is associated with impaired immunological function, increased risk of maternal and infant death, and impaired eyesight (Shakir, 2006a). Iron deficiency anaemia affects physical productivity in adults, and cognitive and physical development in children (Horton & Ross, 2003; FAO, 2004a). Both deficiencies are associated with increased health-care costs and compromised human capital (Horton & Ross, 2003; FAO, 2004a; Shakir, 2006a).

It is also important to note that in many developing countries consumption of local unrefined staples has declined as a result of competition from refined staple foods (Kuhnlein & Johns, 2003). Refined staples may appeal more to consumers' preferences, but are often inferior in nutrient content (e.g. fibre, vitamin E and protein). Even in countries that have seen significant overall increases in food

production and incomes, such as India, there has been a decline in the production of many widely consumed nutritious foods like pulses (hundreds of varieties of peas, lentils and beans). India's production and consumption of pulses has fallen 53% over the past five decades. Per capita annual consumption of pulses has fallen from 27 kg per person to 10 kg per person in 2010. With both the area under production and yields declining or stagnant, prices for these traditional nutrient-rich foods are increasing, and there are few alternatives protein sources available for low-income communities (Commodity Online, 2009).

Risk of malnutrition increases further if dietary energy supply falls below the minimum dietary energy requirement. This is most likely to happen among very poor households that are unable to afford enough food even after substituting starchy staples for more expensive items. Many of these households – even in periods of relative food security – subsist on diets that are too high in carbohydrates and too low in micronutrient-rich foods. Young children, whose gastric capacity is too small for them to consume the large amounts of low energy dense staples needed to meet energy requirements, are especially vulnerable. Given the current situation, these groups are at elevated risk of both malnutrition caused by prolonged lack of dietary diversity and undernourishment caused by inadequate total energy intake.

When combined with reduced expenditures on health care, education and basic necessities, the threat of compromised intake is compounded. For example, HIV and malaria – diseases with very high prevalence rates in many low-income and food insecure areas – both increase requirements for nutrients and inhibit their absorption. If food-insecure households are forced to forgo drug treatment or are unable to afford insecticide-treated bed nets and other simple preventative measures, infected individuals become more susceptible both to the disease and to specific micronutrient deficiencies, such as anaemia, which is closely associated with malaria. Further, since many nutritional deficiencies (e.g. vitamin A deficiency) impair immunological function, the effects of malaria, HIV and other infectious diseases are themselves exacerbated by malnutrition. Finally, as individuals in food insecure households often suffer from chronic nutritional deficiencies, overall susceptibility to infectious diseases even among individuals who are “healthy” (i.e. not exhibiting overt signs of malnutrition) is increased.

²⁹ Armenia, Bangladesh, Ghana, Nicaragua, Zambia.

³⁰ Animal source foods contain haem iron and vitamin A. Many fruits and vegetables contain beta-carotene (a vitamin A precursor) and non-haem iron.

It is usually women who are the first to compromise dietary quality and/or reduce total energy intake in household-level efforts to cope with food insecurity (Shrimpton, Prudhon & Engesveen, 2009). That is, women are usually the first to make sacrifices in terms of their own food consumption when the financial situation deteriorates. The impacts of reduced energy intake and compromised dietary diversity on women during pregnancy and lactation are discussed in detail in chapter 3 of this report.

How trends in undernourishment affect progress towards the Millennium Development Goals

As discussed in chapter 1 and 2, the first Millennium Development Goal (MDG) calls for the eradication of extreme poverty and hunger by 2015, and its achievement is crucial for national progress and development. One of the indicators used to assess progress towards MDG 1 is the prevalence of children less than 5 years old who are underweight for their age. A second indicator is the prevalence of hunger in a population, that is, the proportion of the population whose dietary intake is below the minimum dietary energy requirement.

High levels of undernourishment and subsequent coping mechanisms have negative implications for both these indicators. As undernourishment is considered synonymous with hunger, it serves as a direct measure for the hunger indicator. But undernourishment does not include information regarding the “quality” aspects of food intake, nor does it account for the impact of infectious disease. Thus it cannot, on its own, be used to predict nutrition outcomes and hence cannot be used as a direct measure for the underweight indicator. However, it can serve as a proxy for whether individuals are getting enough to eat in terms of total energy intake. Where prevalence of undernourishment is high, the probability of diets being adequately diversified is low, as the first response in food insecure households is often to save on food costs by cutting down on non-staple food consumption. And dietary diversity is considered to be directly associated with nutrition outcomes, as it is associated with improved child anthropometric status (Arimond & Ruel, 2004). For example, statistics from past crises indicate that malnutrition is a result of undernourishment and subsequent coping mechanisms. In Cameroon during the economic crisis of the 1990s, the proportion of underweight children less than 3 years of age increased by 7-8 % among the poorest half of the population (FAO, 2009b). Similarly, during the drought in Zimbabwe in the mid 1990s, which reduced purchasing power at a rate comparable to that experienced during the current global crisis, stunting among lower-income quintiles increased substantially (FAO, 2009b). Thus undernourishment levels are closely related to the MDG 1

nutrition indicator (underweight), as well as having direct implications for the hunger indicator.

According to FAO (2009b), over the past 20 years, 22 countries have made encouraging progress on reducing undernourishment, and are likely to meet or exceed the hunger target for MDG 1 by 2015. Most of these countries are in east Asia and Latin America (FAO, 2009b). In Africa some countries have made progress, with Ghana, Mozambique, Namibia and Nigeria all likely to achieve the hunger target in terms of undernourishment but not necessarily in terms of underweight (FAO, 2009b). However, challenges remain. As mentioned above, global progress towards MDG 1 has faltered. The percentage of undernourished people in the world began to increase in 2004 (Figure 23), and total absolute numbers for undernourishment have been increasing slowly but steadily for over a decade (Figures 21 and 22).

In terms of underweight, 63 countries out of 117 with available data are on track. This compares with 46 countries out of 94 with available data on track just three years ago, based on trend data from around 1990 to around 2004 (UNICEF, 2009). However, in 34 countries, progress is currently insufficient, and 20 have made no progress at all. Most of these 20 countries are in Africa (UNICEF, 2009). A detailed discussion of the underweight indicator can be found in chapter 2.

That more children may become undernourished as a result of the global downturn and its ripple effects focuses greater attention on both the hunger and nutrition indicators for MDG 1. As good nutrition is key to good health, cognitive development and productivity, slow progress on MDG 1 jeopardizes the achievement of the other MDGs (see chapter 1).

Nutrition transition and the double burden of malnutrition

Trends in undernourishment are complicated by the nutrition transition in many developing countries (Popkin & Gordon-Larsen, 2004). The nutrition transition is characterized by a shift away from diets based on staples, legumes, and fruits and vegetables, and towards more globalized intake patterns that include increased quantities of animal source foods, sugars, fats and (sometimes) alcohol (Popkin & Gordon-Larsen, 2004). Nutrition transition is also associated with increased intake of processed, calorie-dense, nutrient-poor foods (Popkin & Gordon-Larsen, 2004), sometimes referred to as “FMNVs” or foods of minimal nutritional value.

For many countries in the middle stages of nutrition transition, continued high rates of food insecurity and under-

nutrition combined with increased prevalence of overweight and associated non-communicable diseases are resulting in a “double burden” of malnutrition (Doak et al., 2005; Mendez, Monteiro & Popkin, 2005). There is clear evidence that this burden is shifting rapidly towards low-income groups (Arimond & Ruel, 2004). When combined with other trends such as urbanization, the nutrition transition has implications for food and nutrition security and public health at both household and national levels (Mendez & Popkin, 2004).

At household level, rising incomes, increased female labour force participation, increased exposure to mass media, and increasingly sedentary work patterns encourage consumption of convenient processed foods, which are easy to prepare and to consume (FAO, 2006a). Since many processed foods are low in nutritional value, implications for the “quality” aspects of food and nutrition security, as well as associated health outcomes, are negative (Mendez & Popkin, 2004; FAO, 2006a). Such diets may be inadequate in micronutrients but high in sodium, sugar and saturated or trans fat, excessive amounts of which are associated with increased risk of non-communicable diseases (Popkin, Horton & Kim, 2001). The issue of quality is of particular importance in regard to the “double burden” which can exist at household level as well as nationally (Popkin & Gordom-Larsen, 2004). A considerable proportion of households that have undergone the nutrition transition suffer from both overweight and underweight simultaneously. For example, stunted children have been found in the same families as overweight and obese adults (Doak et al., 2005). In these households, nutrition transition diets that are sufficient in terms of energy but insufficient in terms of micronutrients will reduce undernourishment, but may not improve health or nutrition. The risk of poor health outcomes may actually be increased if intake patterns include excessive sodium, sugar and saturated or trans fat. Also, the presence of these double burden households may confound attempts to identify demographics where food availability is an issue. That is, if double burden households occur in the same community as households suffering only from undernutrition, identification of truly food insecure households – as opposed to households where undernutrition is occurring because of consumption of unhealthy diets and/or poor caring and hygiene practices – may be difficult. At household level, disaggregating data where possible by income, rural-urban, geographic region, ethnicity and gender is one way to help distinguish between issues of food availability and other practices that may be causing malnutrition.

At the national level, nutrition transition and its drivers affect food security via their impact on food systems, food supplies and subsequent availability (Mendez & Popkin,

2004). One of the most notable contributors to changing intake patterns is foreign direct investment (FDI) in food processing, which has risen steadily since the 1980s (Wei & Cacho, 2001). As with urbanization, increased female labour force participation and other trends are affecting food and nutrition security at household level, and the increased presence of transnational food corporations in low- and middle-income countries is shaping consumption options at country level. Foreign direct investment makes more processed foods more available to more people by lowering prices and introducing new purchasing channels, e.g. supermarkets (Hawkes, 2005). It also affects the food supply chain. For example, entry of transnational food companies into local markets in China introduced new products and concepts, technologies, quality standards and marketing innovations that challenged local companies. Although many local companies went out of business or saw their market share decrease, others rose to the challenge and increased their own production and marketing of processed foods (Wei & Cacho, 2001). The overall result of increased competition from transnationals in a number of countries has thus been to increase the visibility and availability of processed foods (Hawkes, 2002), some of which may be of low nutritional content.

Foreign direct investment is also affecting food systems because it increases “vertical integration”. Vertical integration refers to the degree to which a company owns or controls both its upstream suppliers and downstream buyers. Within the food industry, it typically occurs when agribusiness and food corporations create integrated large-scale commercial operations that control the production, processing and sale of food products. It is common in developed countries, e.g. the United States poultry industry, and it can have a significant impact on product cost, quality and market penetration. Vertical integration of the food chain is increasing in developing countries. A related trend is increased trade in processed foods. Although foreign direct investment was traditionally considered both an import and an export substitute, more recent evidence indicates that foreign direct investment and trade in processed foods is symbiotic (Bolling & Somwaru, 2001; US International Trade Commission, 2001; Mattson & Koo, 2002). For example, foreign direct investment in fast food has stimulated the spread of fast food chains internationally, leading to increased worldwide consumption of fried potatoes. In a related shift, the market for frozen fried potatoes has expanded, with the amount imported associated with the degree of foreign direct investment in a country’s fast food sector. Increased vertical integration has subsequently affected the local food-supply chain; processors affiliated with foreign direct investment corporations have introduced written contracts for local suppliers favouring large commercial producers over smaller farmers (Hawkes, 2005).

Taken together, trends in foreign direct investment and trade are affecting food supply chains in many developing countries via the types of foods which are available, and the prices at which they are sold.

Not all nutrition transition effects are negative. Increased consumption in total energy and animal source foods are positive trends for many people in low- and middle-income countries. Nevertheless the line between improved intake patterns and over-consumption is increasingly fine among a growing number of demographics, most notably low-income populations with a history of food insecurity (Popkin & Gordon-Larsen, 2004; Mendez, Monteiro & Popkin, 2005). At the national and international level, insisting on public sector accountability and including both under- and over-nutrition in food and nutrition policy frameworks is therefore imperative. In the UNSCN's common agenda for the double burden of malnutrition (SCN, 2006), the private sector is urged to "support the achievement of the MDGs by adopting responsible marketing practices for energy-dense, nutrient-poor foods and drinks" and civil society is urged "to advocate and adopt policies and practices that tackle the double burden of malnutrition and hold governments accountable at all levels."

AGRICULTURE'S ROLE IN IMPROVING FOOD AND NUTRITION SECURITY

Agriculture plays a central role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy (World Bank, 2008), and is thus a key actor in efforts to improve food and nutrition security. Development of the agricultural sector is especially crucial to alleviating poverty in developing countries, where a large proportion of gross domestic product is generated within the primary sector by smallholders. For example, agricultural development has been shown to be up to four times more effective in reducing poverty relative to growth in other sectors, and growth in smallholder agricultural productivity has been shown to have a positive impact on both urban and rural populations in three key ways: lower food prices for consumers; higher incomes for producers; and growth multiplier effects through the rest of the economy as demand for other goods and services increases (Alston et al., 2000; FAO, 2004b). Each of these effects increases purchasing power and thus reduces the need to adopt harmful coping practices. In addition, agricultural policies focused on sustainable development practices have great potential to reduce some of the most harmful effects of the nutrition transition, for example by reducing resource-intensive mono-cropping in favour of more ecologically and environmentally sustainable practices focused on maintaining biodiversity and intercropping.

Challenges facing current production systems

The remarkable increases in global food production that have occurred over the past four decades have been a major achievement but they have also created serious environmental problems. These include the cumulative effects of soil erosion and salinization on land productivity, chemical fertilizer and pesticide hazards, the loss of cropland to desertification, and accelerated conversion of cropland to non-farm uses. Large-scale industrial agriculture is also a driver of genetic erosion, species loss and degradation of wildlife habitat, with over 4000 plant and animal species threatened by agricultural intensification (FAO, 2010). The food and agricultural sector is also responsible for about a third of global greenhouse gas emissions. Many of these trends are described in detail in a report by UNEP (2007).

Reforming the industrial livestock sector is integral to sustainable food security (FAO, 2010). As demand for animal source foods increases, global production of meat is projected to more than double between 1990 and 2050 (FAO, 2006b). However, current industrial livestock production practices may not be sustainable. Livestock is currently the single largest user of land in the world, accounting for 70% of all agricultural land and 30% of total land surface (IAASTD, 2009). It is a key contributor to deforestation, and is responsible for 18% of all greenhouse gas emissions (IAASTD, 2009). It is responsible for 65% of man-made ammonia emissions, which contribute significantly to acid rain and acidification of ecosystems; it is also a major source of water pollution (IAASTD, 2009).

Improved production practices and their contribution to sustainable food and nutrition security

In addition to environmental problems, current production practices can lead to increased marginalization of smallholders who are unable to acquire the technology or economies of scale to compete on global markets. In its 2009 report, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) took stock of the state of global agriculture and concluded that improving access of the rural low-income groups, namely landless labourers and smallholders, to food, land, water, seeds and improved technologies was essential to ensuring sustainable food security (IAASTD, 2009). The report also found that investments in agricultural knowledge, science and technology were needed to maintain productivity in ways that protect the natural resource base and ecological provisioning of agricultural systems. These two conclusions both point towards the need for increased investment in small-scale agriculture, small-scale irrigation, food processing and other strategies that empower poor subsistence farmers and encourage environmental stewardship.

Sustainable agriculture is important not only for ensuring the economic welfare of smallholder and other vulnerable groups; it is also linked to improving dietary diversity and nutrition outcomes. Indeed, many of the production practices that are currently being promoted as ways to improve environmental viability also represent strategies to improve dietary diversity, and vice versa. Examples include:

- agricultural extension services that offer communities information and improved inputs, including seed and cultivars for better crop diversity and promotion of bio-diversity, e.g. intercropping cereal crops with drought-resistant legumes such as cowpea or pigeon pea;
- integrated agro-forestry systems that reduce deforestation and promote harvesting of nutrient-rich forest products, e.g. the Quesungual system in Honduras which promotes maintenance of forest canopy in conjunction with crop cultivation;
- education and social marketing strategies that strengthen local food systems and promote cultivation and consumption of local micronutrient-rich foods, e.g. pulses and millet, as well as agricultural extension services that provide nutrition education at the community level;
- promotion of aquaculture and small livestock ventures that include indigenous as well as farmed species, e.g. polyculture fish farms that include both *tilapia* and smaller, local species such as *darkina*;
- biofortification via research and development programmes that breed plants (including local and traditional cultivars) and livestock selectively to enhance nutritional quality, e.g. increasing protein content of mung bean;
- reduction of post-harvest losses via improved handling, preservation, storage, preparation and processing techniques, e.g. solar drying of fruits and vegetables that are rich in beta-carotene.

CHALLENGES TO FOOD AND NUTRITION SECURITY

Balancing a long-term concern for the environment over the short-term needs of smallholders and other vulnerable groups cannot be at the expense of their immediate survival and livelihoods. For example, while deforestation has serious consequences for the environment, the short-term survival of many populations depends upon slash and burn cultivation, or sale of firewood and charcoal. Attempts to prevent deforestation that do not take this conflict into account will either fail or have disastrous social consequences (Thompson, 2006). Similarly, creating an enabling environment to fight hunger and malnutrition requires addressing a wide variety of constraints. Many of these constraints impinge upon agriculture-based approaches to improving food and nutrition security, either directly, as in the case of marginalization of female farmers, or indirectly, as in the case of population growth.

Although the effects of the global downturn are related to these constraints, and in some cases have exacerbated them, it is important to note that the constraints existed prior to the crisis, driven by longer-term problems of marginalization and inequality. In addition to long-term socioeconomic, demographic, and political challenges, climate change and demand for biofuel are relatively recent developments whose repercussions pose serious challenges to achieving sustainable food and nutrition security.

Socioeconomic and health-based challenges: gender inequity, HIV

Evidence based on household-level data shows that reducing gender inequity is an important part of the solution to global hunger. The resources and income flows that women control have repeatedly been shown to wield a positive influence on household health and nutrition (World Bank/IFPRI, 2007). A series of studies have found close associations between female primary school attendance and decreases in country-level poverty rates (Von Grebmer et al., 2009). Empowering women in terms of education, political participation, and control of assets and resources has great potential to improve purchasing power, the management of scarce household resources, and self respect, as well as knowledge of good habits regarding food consumption, which are all crucial to improved nutrition outcomes. Within the agricultural sector, marginalization of female farmers inhibits their economic and political empowerment, and is a serious constraint to improved food and nutrition security. For example, although women may carry a very heavy workload, their work may not be valued as highly as that of men. Gender bias and gender blindness persist: policy-makers, development planners and agricultural service deliverers still tend to perceive farmers as being male. Women therefore find it more difficult than men to gain access to the resources – land, credit, agricultural inputs, technology, and extension and training services – that enhance productive capacity. In most developing countries, smallholders of both genders lack access to adequate resources, but women's access is further constrained by cultural, traditional and sociological factors (Viatte et al., 2009).

The continued high prevalence of HIV, especially in many countries of sub-Saharan Africa challenges food and nutrition security at multiple levels. At the individual level, the disease impairs absorption of essential nutrients and increases nutritional requirements. At the household level, HIV can decrease purchasing power because of sickness, absenteeism, the inability to do work and unemployment, as well as increase the time and money spent on treatment and care. In the agricultural sector, the reduced ability to do the kind of physical work required for farming leads to reduced productive capacity and subsequent decreased purchasing power. For smallholders who are primarily subsistence farm-

ers, this may have direct consequences on their food supply. Ripple effects for many agricultural households may include children being removed from school and further crop losses, resulting from reduced ability to till, purchase inputs, weed or harvest.

Demographic and political challenges: population growth, urbanization, political instability and conflict

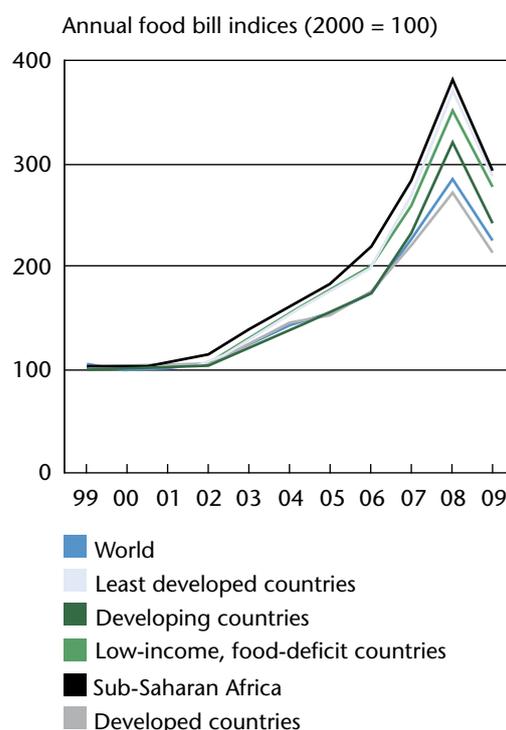
Population growth affects food and nutrition security because it drives increased demand for food in terms of both domestic production and imports. The global population grew from around 2 billion in 1950 to just over 6 billion in 2009, and is projected to grow to about 9 billion in 2050 (UN Population Division, 2009b). Population growth over the next four decades is predicted to occur mostly in the least developed countries of Africa and Asia, with the population of Africa rising from 1 billion to 2 billion, and the population of Asia rising from 4 billion to 5 billion (UN Population Division, 2009b). Although the fertility rate in developing countries as a whole fell from 5 in the seventies to less than 3 today, it was still 4.8 in the least developed countries in 2005, and in the least developed countries of sub-Saharan Africa it was 5.8 (UN Population Division, 2009b). Adolescent pregnancies are also high in the least developed countries, with 117 births per 1000 women aged 15-19 years as compared with 37 per 1000 in the developing countries as a whole (FAO, 2009h). These high rates of population growth increase the probability of food deficits, especially for countries where yield gaps are wide and/or where food imports constitute a considerable proportion of domestic food supply. This is of particular concern in sub-Saharan Africa, which has the lowest yields in the world, one third of the global average, and where 90% of production growth over the past 20 years has been the result of expansion of the area cultivated (FAO, 2009b). Sub-Saharan Africa endured the largest rise in food import costs, as measured from 2000 to the peak of the food price crisis in 2008, but the expected decline in the overall bill between 2009 and 2010 – from USD 28.4 billion to USD 21.3 billion – is among the smallest of any geographic or economic group, as illustrated in Figure 24 (FAO, 2009h). Political instability is also a major challenge to food and nutrition security. Conflict disrupts or prevents agricultural production, transport and market access, and creates large populations of refugees and internally displaced persons who make heavy demands on local and national food supplies. Political instability can also destabilize support systems, such as input distribution and subsidy programmes, and can destroy market and other infrastructure. Political instability is one of the most common and persistent challenges to food security. For example, of the 31 countries categorized by FAO's global information and early warning system (FAO, 2009i) in December 2009 as "in crisis and

requiring external assistance", 19 listed conflict-based reasons for their high levels of food insecurity (Table 28).

The proportion of the global population living in urban areas surpassed those living in rural areas in 2009. Projections indicate that by 2050 the majority of the global population (just over 5 billion people) will be living in the urban areas of countries that are currently considered developing, with a third of the global population living in rural areas (Figure 25). For low income groups living in urban areas, food insecurity is caused primarily by their low incomes and consequent inability to acquire adequate supplies of safe and nutritious food. Volatile food prices and rising unemployment exacerbate the problem.

For many urban populations facing food insecurity, an important source of food is urban and periurban agriculture. Production and processing of crops – mostly fruits and vegetables – and of livestock is frequently part of urban and

Figure 24. Sub-Saharan Africa's expenditure on food imports (index = 100 in 2000)



Source: FAO (2009h)

On the back of falling international quotations and freight rates, import bills look set to decline sharply in 2009. While good news for vulnerable countries, their burden, however, of purchasing food commodities on the international market place remains higher than that on the world at large and indeed on developed countries.

periurban livelihood strategies, and the food produced forms a large part of informal-sector economic activity.

While urban and periurban agriculture has great potential to increase both total energy and nutrient intake, there

are also major health hazards associated with its practice (IFPRI, 2006). These include contamination of crops from air pollution and industrial effluents, and the risk of infectious diseases posed both by keeping livestock and by using biological wastes as fertilizers. Moreover, in areas

Table 28. Effect of conflict and political instability on food supply: countries in crisis requiring external assistance, December 2009

Nature of food insecurity	Main reasons
Exceptional shortfall in aggregate food production and/or supplies	
Kenya	Adverse weather, lingering effects of civil strife
Lesotho	Low productivity, HIV/AIDS pandemic
Somalia	Conflict, economic crisis, adverse weather
Swaziland	Low productivity, HIV/AIDS pandemic
Zimbabwe	Problems of economic transition
Iraq	Conflict and inadequate rainfall
Widespread lack of access	
Eritrea	Adverse weather, internally displaced persons, economic constraints
Liberia	War-related damage
Mauritania	Several years of drought
Sierra Leone	War-related damage
Democratic People's Republic of Korea	Economic constraints
Severe localized food insecurity	
Burundi	Internally displaced persons and returnees
Central African Republic	Refugees, insecurity in parts
Chad	Refugees, conflict, inadequate rainfall
Congo	Internally displaced persons
Côte d'Ivoire	Conflict-related damage
Democratic Republic of the Congo	Civil strife, returnees
Ethiopia	Adverse weather, insecurity in parts of the country
Guinea	Refugees, conflict-related damage
Guinea-Bissau	Localized insecurity
Sudan	Civil strife (Darfur), insecurity (southern Sudan), localized crop failure
Uganda	Localized crop failure, insecurity
Afghanistan	Conflict and insecurity
Bangladesh	Cyclones
Myanmar	Past cyclone
Nepal	Poor market access, floods and/or landslides
Pakistan	Conflict, internally displaced persons
Philippines	Tropical storm
Sri Lanka	Internally displaced persons, post-conflict reconstruction
Timor-Leste	Internally displaced persons
Yemen	Conflict, internally displaced persons

Source: FAO

where the value of land is on the rise, urban and periurban agriculture may subsequently decline because of pressure to use the land for other, more lucrative ventures. As urbanization rates increase throughout the developing world (UN Population Division, 2009c), improving food and nutrition security for the urban poor poses a challenge in terms of economic access and food safety.

Environmental challenges: climate change and demand for biofuel

Several recent UN agency and other reports conclude that even if practical steps are taken now to try to mitigate the effects of climate change, the world will become increasingly food insecure over the next few decades (Easterling et al., 2007; IFPRI, 2009; Inter-Agency Standing Committee, 2009; UNEP, 2009). Climate change will exacerbate existing threats to food security. By 2050, the number of

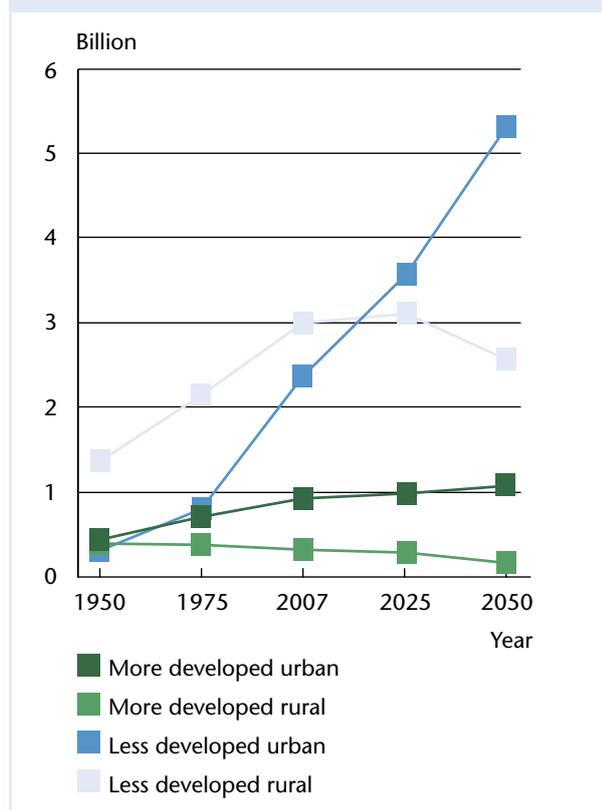
people suffering from hunger is projected to increase by 10–20%³¹ (Parry et al., 2009), and child malnutrition is anticipated to be 20% higher compared to a scenario of no climate change (Inter-Agency Standing Committee, 2009). In addition, a UNEP report predicts that up to 25% of the world's food production is likely to be lost by 2050, as a result of "environmental breakdowns" (IFPRI, 2009). These breakdowns include the melting and disappearing glaciers of the Himalayas, which supply water for irrigation for nearly half of Asia's cereal production – one quarter of world production (IFPRI, 2009). They also include accelerated threats from invasive insects, diseases and weeds, which are projected to reduce yields by up to 6% worldwide (IFPRI, 2009), as well as increased water scarcity, which is projected to reduce crop yields by up to 12% worldwide (IFPRI, 2009). These examples are included in the pathways outlined below:

- increased frequency and intensity of extreme climatic events such as heat waves, droughts, desertification, storms, cyclones, hurricanes, floods;
- sea-level rise and flooding of coastal lands, leading to salination and or contamination of water, agricultural lands and food;
- hygiene and sanitation problems leading to increased burden of infectious disease;
- reduced forest productivity;
- proliferation of pest species, plant and livestock diseases.

Although these pathways will negatively affect food and nutrition security, it is important to note that some impacts of climate change, such as CO₂ "fertilization", may be positive.³²

Changes in the patterns of extreme weather events such as floods, droughts, cyclones and hurricanes affect food production as well as stability of and access to food supplies. Both access to irrigation water and rainfall are threatened by extreme weather events, seriously disrupting production cycles, reducing yields and increasing livestock losses. Temperature rises of 1–2 °C have been shown to reduce yields in agro-ecological zones that are seasonally dry and tropical. Further warming has been shown to have negative impacts on global food production in all regions (Easterling et al., 2007). Smallholders and landless labourers who cannot afford to engage in risk management strategies, e.g. crop insurance, are especially vulnerable to these weather-

Figure 25. Growth of rural and urban populations in developing and developed countries



Source: UN Population Division, 2007.

31 Scenario based on a pathway of continuing high population growth, regional disparities of income and high global temperatures (IPCC Special Report on Emissions Scenarios – SRES A2).

32 This list of pathways is not exhaustive. For an extended discussion of the ways that climate change is affecting food and nutrition security, please see: The impact of climate change and bioenergy on nutrition, Rome, FAO, 2010 (<http://www.fao.org/docrep/010/ai799e/ai799e00.htm>, accessed 30 March 2010).

induced shocks. Rural to urban migration rates may increase for these populations, thus increasing demand for food in cities. In low-lying areas such as Bangladesh, a rise in sea level may further reduce food and nutrition security via salination, inundation, erosion of cultivated land, and fishery contamination (FAO, 2003).

Climate change can further negatively affect nutrition through its effects on hygiene and sanitation, namely increased incidence of diarrhoea and other infectious diseases (Confalonieri et al., 2007). Associations between monthly temperature and diarrhoeal episodes, and between extreme rainfall events and monthly reports of water-borne disease outbreaks, have been reported worldwide. Higher temperatures have been associated with increased episodes of diarrhoeal disease in adults and children in Peru, where diarrhoeal incidence reports increased 8% for each degree of temperature increase (Checkley et al., 2000). Climate change is projected to increase the burden of diarrhoeal diseases in low-income regions by approximately 2-5% by 2020 and will disproportionately affect low-income populations already experiencing a large burden of disease (McMichael et al., 2004). Like HIV, diarrhoea simultaneously increases nutrient requirements and impairs absorption of nutrients. For populations suffering from multiple shocks induced by climate change and/or other variables, an increase in diarrhoeal and other infectious diseases could pose a serious threat to nutrition security.

Elevated risk of fires, insect outbreaks, wind damage and land degradation from accelerated slash and burn practices will impact both physical food availability and purchasing power for those whose livelihoods are partially or fully dependent on forest products. Wood, honey, cane and grass products, nuts, bushmeat, mushrooms and medicinal herbs are all examples of forest products (FAO, 1998) threatened by climate change.

Climate change is also likely to increase risks created by the spread of plants and plant pests, animal diseases and invasive species across international borders. For example, the wind-borne Ug99 wheat rust fungus spread from Uganda to Kenya, Ethiopia, Yemen and the Islamic Republic of Iran, and by 2008 had threatened crops in south and central Asia. As up to 80% of African and Asian wheat varieties are susceptible to wheat stem rust, this disease has the potential to exacerbate current high wheat prices and harm rural livelihoods, reducing purchasing power and posing a threat to food and nutrition security (FAO, 2008b).

In summary, climate change will affect food and nutrition security through reduction of income from animal production, reduction of yields of food and cash crops, lowered

forest productivity, changes in aquatic populations, and increased incidence of infectious disease (Cohen et al., 2008).

In addition to climate change, the growing demand for biofuel poses a challenge to food and nutrition security. Although it creates potential opportunities for increased income among smallholders and other members of the rural sector, biofuel demand can also be a threat in terms of decreased food availability (Figure 26). Land previously used for cultivation of food crops may be diverted to biofuel production, and food availability may subsequently be reduced, leading to shortages and associated price effects (Viatte et al., 2009). In terms of nutrition security, it is important to note that women farmers, who are often in charge of food crop cultivation, may be further marginalized by the substitution of biofuel crops for food crops.

The resources and income flows that women control have repeatedly been shown to have a disproportionately positive impact on household health and nutrition (Von Grebmer et al., 2009). In some cases, increased biofuel production may decrease the purchasing power and assets controlled by women, with negative implications for household level nutrition outcomes. In addition, demand for biofuels may accelerate unregulated or poorly regulated foreign direct investment (otherwise known as “land grabs”), as well as the clearing of land for cultivation, including tropical forests and wetlands. Finally, intensified production of energy crops such as sugarcane, as well as increased cereal production to meet competing demand for food, feed and fuel, may raise use of chemical fertilizers to dangerous levels, increasing risk of illness and environmental deterioration, both of which have negative implications for nutrition (Viatte et al., 2009).

ACTIONS TO PROMOTE FOOD AND NUTRITION SECURITY AT HOUSEHOLD AND COUNTRY LEVEL

Improving smallholder production systems and capacity should be a primary goal in efforts to promote food and nutrition security. Many of the world’s poorest and most vulnerable are smallholders, and in many developing countries – and all least developed countries – domestic food production occurs predominately through small-scale farming. However, projects and programmes that aim to improve food and nutrition security through increased yields will be most successful if they are implemented in tandem with efforts to improve crop and dietary diversity.

Since many of the world’s most vulnerable populations are landless and/or urban, promoting food and nutrition security requires looking beyond smallholders. Actions to improve food and nutrition security among these groups, as well as smallholders, include raising incomes, providing

livelihood support, creating social safety-nets and focusing on maternal and child health. In addition, increasing dietary diversification through nutrition education and social marketing is essential to improving food and nutrition security, regardless of population group. Poverty reduction – at national, regional and international levels – is required. Other requisites are frameworks for agricultural policy, and for food and nutrition security policy, that promote improved nutrition outcomes as central to national development goals and include explicit nutrition programmes.

Enhancing smallholder productivity

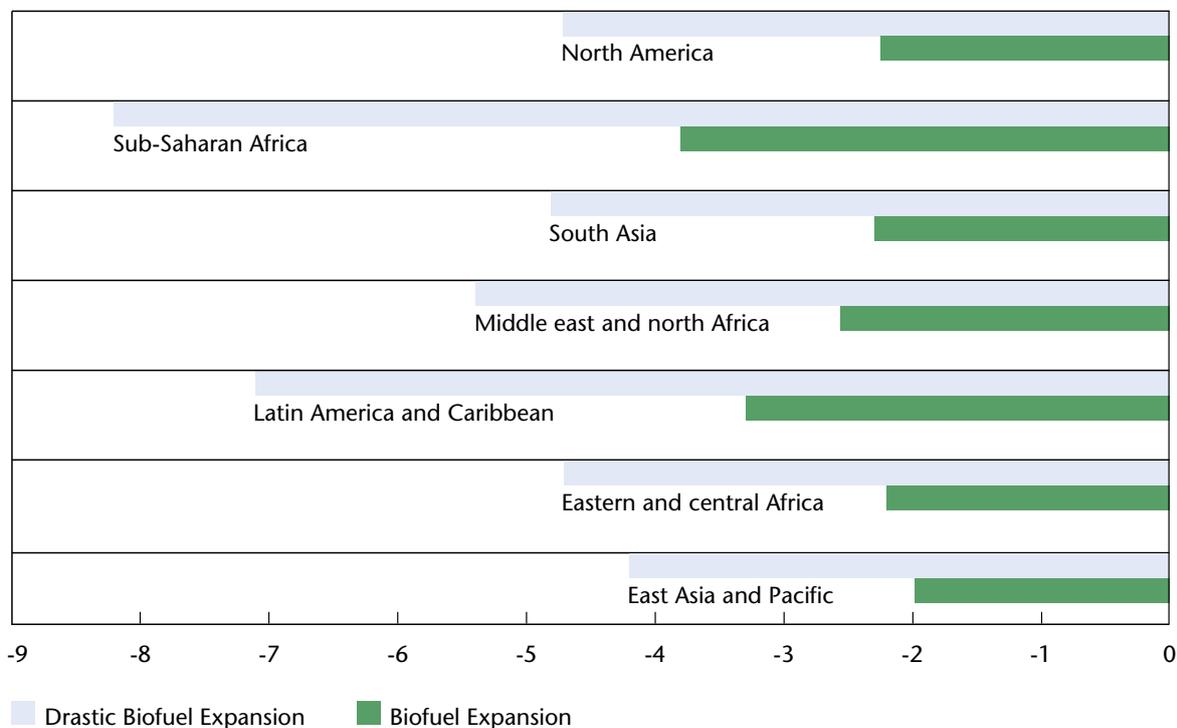
Enhancing smallholder production and productivity can be an economically viable way to increase agricultural system diversity, contributing to the resilience of food systems and promoting the nutritional quality and diversity of local foods. Increasing smallholder production to improve food and nutrition security requires investment in the following:

- improving availability of seeds and other inputs;
- developing water resources;
- strengthening and expanding agricultural cooperatives and farmers' organizations;

- measures for sustainable resource management and conservation of biodiversity;
- programmes for animal production and fisheries inputs;
- reducing post-harvest losses;
- research to improve understanding of how to link agriculture with nutritional knowledge.

One of the primary constraints smallholders face is access to seeds and other inputs. Subsidy schemes, programmes that promote soil fertility and sustainable land management, input market development, and support for farm equipment and structures can increase access to inputs for small farmers. For seeds, early generation multiplication and strengthened distribution systems are measures that can be taken at municipal and district level, while seed production can be undertaken by farmers' organizations at village level. Bangladesh, Lao People's Democratic Republic, Lesotho and Uganda are examples of countries working to strengthen the capacity of farmers' organizations for seed production (FAO, 2009j). When community seed production is working well, it can facilitate the adoption of improved and locally adapted varieties, reduce transaction and trans-

Figure 26.
Projected impact of biofuel demand on food energy availability, 2010-2020 (% change)



Source: IFPRI.

port costs, and reach even the smallest and most vulnerable smallholders.

According to FAO, 20 of the 33 countries that required external food assistance in December 2008 were affected by drought or flood (FAO, 2009j). Most of these countries have avoided large-scale irrigation and water resource projects, focusing instead on rehabilitating or promoting small-scale irrigation schemes appropriate for smallholders. Countries such as Jamaica, Madagascar, Mali, Nepal and Swaziland propose investments in small-scale irrigation (FAO, 2009j). In Nepal, farmers are encouraged to invest in micro-irrigation, comprising low-cost drip systems, rain-water harvesting tanks, treadle pumps, rower pumps and dug wells, which irrigate up to 0.5 hectares of land (FAO, 2009j). These systems suit smallholders, whose productivity and cropping intensity can be doubled if access to irrigation is assured.

Strengthening and expanding agricultural cooperatives and farmers' organizations is key to improving productivity as well as enhancing smallholders' livelihoods more generally. The former is achieved when cooperatives and farmers' groups are able to access credit, information and other important goods and services better than individuals. The latter can occur in a number of ways, including granting small farmers sufficient political power to protect themselves and benefit from the long-term leasing of their agricultural land by foreign investors, as well as increased opportunities for post-harvest value addition, e.g. food processing. Both of these capacities are important in developing countries where foreign direct investment poses a threat to smallholders who may not have well-defined property rights, and who cannot on their own afford the equipment and training required for food processing and other activities that add value to their crops. Cooperatives and farmers' groups empower smallholders by creating informal "unions" which increase their bargaining power as well as granting farmers a louder political voice. For example, in Indonesia and Mexico the national plans for food security include forming farmers' groups that develop their own farmer group development plans. Farmers learn how to prioritize, cost and manage their own activities. The groups are financed via a revolving fund system, and although they are provided with start-up capital, they become responsible for their own funding once the initial financing is spent. Another example is Sierra Leone, which has developed a community-based extension and capacity-building programme which uses community-based farmer field schools as the primary instrument for improving rural food security and livelihoods within the framework of the national recovery strategy. Collective action by small food producers can also help to orient and shape markets to better capture and increase the availability of

nutritious local foods, and can increase the availability of affordable fruits and vegetables for urban consumers.

Strategies aimed at boosting production should include actions that protect natural resources. Integrated pest management attempts to control pests through the influence of natural predators and parasites, thereby reducing the need for pesticides. Integrated soil fertility management combines the use of both inorganic and organic fertilizers, such as composts, manures and nitrogen-fixing plants, to increase yields, rebuild depleted soils, improve moisture retention and protect the natural resource base (FAO, 2009j). In addition, promotion of traditional cropping systems and crop diversification can protect the natural resource base via decreased use of chemical fertilizers and improved soil fertility. For example, reintroduction of the traditional *milpa* system – intercropping of maize, beans and vegetables – in central America is gaining increased attention as a sustainable alternative to maize monocropping (FAO, 2009j; Viatte et al., 2009). Diversity in food production is also important for adapting to climate change. For example, many traditional but neglected "orphan" crops, e.g. sorghum and millet, are resistant to drought and other stresses related to climate change.

Support to programmes for animal production and fisheries can be adapted to smallholders, and provide important contributions to household food and nutrition security. For example, in Tajikistan, home-based livestock husbandry, including poultry, sheep and goats, is being promoted. The programme aims to increase the purchasing power and food and nutrition security of some of the most vulnerable and food-insecure households in rural areas. The main features are distribution of improved laying hens, training on better poultry management, improved veterinary services, and the rehabilitation of sheep and goat stocks through improved management and husbandry practices (FAO, 2009j).

Reduction of post-harvest losses contributes significantly to improved food and nutrition security in many developing countries, and deserves more attention from policy-makers and government. Significant proportions of fresh produce, animal-source foods and cereals are lost to spoilage and infestation on their journey to the consumer. For example, dairy losses in the United Republic of Tanzania amount to about 60 million litres a year, more than 16% of total dairy production in the dry season and 25% of production in the wet season. In Uganda, approximately 27% of all the milk produced is lost, equivalent to US\$ 23 million per year (FAO, 2009j). Reduction of post-harvest losses has great potential to increase rural income and employment, reduce food prices in urban areas and improve food safety. Although some measures require economies of scale and are not adaptable to smallholder contexts

(e.g. large, refrigerated storage facilities), others are quite simple and are appropriate for even very low-income farmers. For example, a review of projects in the Dominican Republic, Haiti and Niger concluded that solar drying of fruits and vegetables rich in beta-carotene was an appropriate technology for preserving these sources of vitamin A. Solar dried fruits and vegetables maintain high levels of beta-carotene for up to 6 months (FAO/ILSI, 1997).

Beyond smallholders: actions to improve food and nutrition security among urban and landless populations

Many low-income urban and rural households are net food purchasers (FAO, 2008c). With purchasing power being reduced by the global economic downturn, many vulnerable households have been pushed deeper into poverty and food insecurity, increasing the risk of malnutrition. Increasing incomes, focusing on maternal and child health, and providing livelihood support and social assistance programmes are integral to improving food and nutrition security among these consumers as well as for smallholders.

Increased purchasing power is a direct result of livelihood diversification, which broadens household income sources thereby strengthening resilience to the sorts of shocks experienced during the global downturn. Examples of livelihood diversification for both rural and urban populations include community-based, in-kind revolving funds and cottage industries that add value to raw agricultural products, e.g. oil seed processing. In addition to generating income, food processing initiatives can help to meet urban food needs, especially in areas where storage facilities are inadequate and where food safety is an issue. The in-kind revolving funds are similar to the farmers' cooperative revolving funds described in the preceding section. However, in this case, seeds and/or small livestock, as opposed to credit, are provided, and beneficiaries do not have to be smallholders.

Social assistance measures such as social safety nets address many of the entrenched socioeconomic issues that challenge food and nutrition security. They are also important for reducing the harmful effects of coping mechanisms used in times of crisis, such as those that were observed during the recent global downturn. Social safety-nets are transfer programmes targeted to low-income groups or those vulnerable to poverty and shocks. They can be cash-based, in-kind, conditional or unconditional, and they allow vulnerable households to cover their most essential needs. When safety nets are in place before a crisis, they decrease the requirement for emergency relief, prevent or at least reduce distress sales of productive assets such as livestock and seed, and encourage recipients to undertake slightly riskier behaviours e.g. crop diversification, invest-

ing in new technologies that may result in sustainable increases in income and food security. Safety nets offer many households the opportunity to progressively graduate from poverty, and they decrease dependency on aid. In many cases, women and children are the primary beneficiaries of these policies. For example, the majority of conditionalities for *Oportunidades*, one of the largest cash transfer programmes in the world, are targeted at mothers and their children.

The positive impact of social assistance measures increases when combined with livelihood diversification initiatives. For example, Save the Children in the Amhara province of Ethiopia recorded significant progress in building livelihoods, assets and resilience after implementation of a government programme that combined a productive safety-net initiative with livelihood investment activities. After three years of a food or cash safety-net and livelihood support (e.g. inputs, and technical and organizational skills transfers), poor families significantly increased their cash income – often doubling it – and were able to invest in new productive assets, including oxen, water pumps, and bee-hives, further broadening their income base (Save the Children UK, 2009a). A Save the Children study in Niger found growth in food production among low-income families as a result of a 3-month cash transfer programme that enabled households to spend more time working their own land instead of working as hired labour for wealthier farmers (Save the Children UK, 2009b).

Safety nets may also directly improve nutritional status and maternal and child health. For example, conditional cash transfer programmes in Colombia, Mexico and Nicaragua decreased stunting rates by 7, 10 and 5.5 percentage points, respectively (Adato & Hoddinott, 2007). Save the Children documented improved dietary intake among some of the beneficiaries of the Amhara programme mentioned above.

Increasing dietary diversification through nutrition education and social marketing

The concept of nutrition security, which refers in part to the “quality” component of food production, consumption and physiological need, is a crucial consideration in efforts to reduce malnutrition. Although many of the actions cited above include inherent nutrition components, often an explicit focus on nutrition security is required to “activate” these aspects of the project or programme. For example, reducing animal mortality rates and increasing production of small livestock may not be enough to actually improve intake patterns. This is because many low-income households tend to use livestock as an asset base, as opposed to an immediate source of food. Similarly, increases in purchasing power resulting from livelihood diversification do not guarantee improved intake patterns. This is because direct

reductions in income poverty do not generally result in proportional reductions in malnutrition (Shakir, 2006).

Extension advice, especially that geared towards women and school-based nutrition services, is thus necessary to “activate” the latent nutrition aspects of many agricultural development projects and programmes. For example, promotion of traditional cropping systems should be accompanied by extension-based education services stressing the importance not just of growing, but also of consuming a diversity of foods. Extension services which encourage crop diversification, for example via distribution of high-nutrient foods such as orange-fleshed sweet potatoes, must be accompanied by education and social marketing efforts to encourage increased intake of these foods (Low et al., 2007). Promotion of gardens in schools, communities or individual households increases awareness regarding the importance of good nutrition, building local capacity, and increasing the physical availability of fruits and vegetables (see Box 2). Education programmes that are extension or school-based can also promote food safety. Promotion of preservation techniques to maintain micronutrient levels in foods not only reduces post-harvest losses but, when coupled with education services that emphasize the importance of dietary diversity, may also improve intake patterns.

As the double burden of malnutrition increases in developing countries, educating consumers regarding the health risks of highly processed foods low in micronutrient content is increasingly important. This type of nutrition education is of particular relevance for low-income urban households consuming a high percentage of their meals outside the home, and for those populations who are exposed to and consume excessive amounts of processed foods of low nutrient content.

Appropriate policy and programme frameworks

The fact that hunger was increasing even before the food and economic crises suggests that policy and programme frameworks are and remain insufficient, and that a right-to-food approach has an important role to play in improving food and nutrition security. To lift themselves out of hunger, the food-insecure need control over resources, access to opportunities and improved governance at the international, national and local levels. The right to food is, first and foremost, a basic human right enshrined in international law (UN Economic and Social Council, 1999). It is the right of every person to have continuous access to the resources necessary to produce, earn or purchase enough food, not only to prevent hunger, but also to ensure health

Box 2. Keyhole gardens for improved food and nutrition security: an example of extension-based nutrition education

- A keyhole garden (so-called because of its shape) is a raised stone-walled garden. Keyhole gardens can be built in places where it is difficult to build normal gardens (rocky areas, with shallow arid or compacted soils, etc.), and are often placed near the entrance of dwellings to facilitate their watering with household wastewater. They maintain their soil fertility for 5 to 7 years; produce food all year round, even under harsh temperatures; and are prolific, supporting production of at least five varieties of vegetables at a time. Keyhole gardens have a simple drip-irrigation system using a lined basket placed in the centre of the garden, which disperses water throughout. This innovation allows these gardens to use significantly less water than more conventional gardens.
- Building and maintaining a keyhole garden requires seeds, tools and horticultural knowledge, all of which can be provided by agricultural extension staff, often in collaboration with local and international non-governmental organizations. Extension workers trained in nutrition education can provide information regarding the preparation and preservation of the garden’s produce. Extension staff are often well-positioned to follow up on communities’ attempts to create keyhole gardens and other horticulture ventures. They are able to provide seed and other inputs at regular intervals, as well as to provide continued coaching regarding the importance of dietary diversity. This is of particular importance in areas where extension staff may have long-standing relationships with the community.

and well-being. The recommendations below are all made within a right-to-food framework, with the ultimate goal of reducing marginalization and disempowerment of the poorest.

“Mainstreaming” food and nutrition security initiatives into national development agendas increases programme efficacy as well as the impact of such programmes on nutrition. Poverty reduction strategy papers, United Nations development assistance frameworks, and five- or ten-year plans are all examples of national policy frameworks into which food and nutrition security objectives need to be incorporated. Mainstreaming requires convincing policy-makers that reduction in income poverty and yield gaps do not guarantee proportional reductions in malnutrition, and that specific policies and targeted interventions for improving nutrition outcomes are therefore necessary if the Millennium Development Goals are to be achieved. Promotion of social protection, equitable land tenure regulations, national food fortification programmes, monitoring and evaluation of food and nutrition situations, and capacity-building measures are some of the most important aspects of such frameworks.

As discussed above, social protection measures enable a variety of vulnerable population groups to engage and invest in productive activities that they could not have otherwise initiated and/or sustained. An integrated policy approach that combines social protection measures, such as safety nets, with livelihood diversification strategies that broaden income streams allows households in both rural and urban areas to manage risk, increase resilience to shocks, and create opportunities for increased food and nutrition security.

Land tenure is an issue throughout the developing world, and female smallholders and urban farmers are two groups whose access to land is often threatened, especially in situations where documentation of holdings is insufficient or informal. Foreign direct assistance, for example, can threaten local production systems in terms of ownership rights. Whenever possible, improving vulnerable communities’ land tenure rights through statutory recognition and recording of informal and tenure systems should be encouraged. However, in situations where rules, procedures and registration fees may prove prohibitive, recognizing temporary rights per cultivation season and/or recognizing and administering – in an equitable way – rights of access to idle cultivable land are alternatives.

Lack of technical and institutional capacity in assessing the local food and nutrition situation, prioritizing needs, designing intervention strategies, and providing operational and managerial support is a serious constraint to achieving food and nutrition security in many developing countries. There is a shortage of qualified personnel at every level – national, district, municipal and local. Community nutrition workers are often limited or non-existent. Agricultural extension workers and health staff receive either basic or no training in nutrition, and have weak skills in communicating nutrition information to specific population groups. Procuring funding for training nutrition specialists at all levels of government should thus be a priority.

Monitoring and evaluation of food and nutrition security projects and programmes improves service delivery and increases government accountability. Early warning systems, such as the Integrated Food Security Phase Classification, increase awareness of pending shocks and can thus help prepare for and mitigate their impact. The data generated by such systems can increase policy-makers’ awareness of threats to food and nutrition security, and may help raise nutrition’s “profile” on national policy agendas, especially if nutrition information is collected along with other indicators. For example, vulnerability assessments are often based primarily on fluctuations in the market price of staple foods, and current production and yield levels. Supplementing these reports with information from household dietary diversity scores can increase awareness regarding the importance of consuming a varied diet, and highlight the distinction between the quantity and quality aspects of consumption. Whenever possible, surveillance data should be disaggregated by income, demographic, ethnicity, gender and other criteria relevant to food and nutrition security.

National food fortification programmes can be appropriate where there is a strong cash economy, an effective food marketing system, an appropriate vehicle, centralized processing and a population with a specific deficiency that can be effectively reached by such a programme. Where these requirements are not met, combating micronutrient deficiencies through wider food-based approaches is strongly recommended.

In addition to country-level recommendations, regulatory frameworks and agreements should support standard-setting initiatives that promote food and nutrition security

Box 3.
The reformed Committee on Food Security:
Working together to reduce food insecurity

The vision of the Committee on World Food Security (CFS) is to be the most inclusive international and intergovernmental platform for all stakeholders to work together to ensure food security and nutrition for all. In 2009 the CFS underwent a reform to make it more effective by including a wider group of stakeholders and increasing its ability to promote policies to reduce food insecurity. The CFS now has a structure that allows input from all stakeholders at global, regional and national levels.

The thirteen member Bureau is complimented by an Advisory Group made up of representatives from UN agencies and other UN bodies, civil society and non-governmental organizations, international agricultural research institutions, international and regional financial institutions, private sector associations and philanthropic foundations.

A High Level Panel of Experts – Food Security and Nutrition (HLPE-FSN) of internationally recognized experts in a variety of food security and nutrition-related fields will provide scientific and knowledge-based analysis and advice on policy-relevant issues and also identify emerging trends.

within a global context (see box 3). Areas of focus should include:

- preservation of biodiversity, and conservation, sound management and sustainable use of natural resources, e.g. promotion of integrated agro-forestry systems;
- incorporation of hunger reduction and nutrition objectives into climate change negotiations, e.g. funding for innovative technologies to improve the adaptive capacity of production systems;
- promotion of pro-poor food and agricultural development policies that support low-income groups and are conducive to nutrition security and encourage positive spillovers, e.g. responsible foreign direct investment that includes smallholders and leads to improvements in local food processing technologies;
- promotion of fair and transparent global markets, e.g. border policies that do not restrict developing countries' access to global markets.

CONCLUSION: EMERGING THEMES IN AGRICULTURE AND FOOD SECURITY

At the global level, undernourishment has been increasing since 1995. Coping strategies employed by households to deal with increased food insecurity, including reduced expenditures on food with consequent declines in the quality (micronutrients) and quantity (calories) of food intake, have increased the risk of poor nutrition outcomes. Global trends in production, trade and foreign direct investment as well as changing patterns of consumption have complicated the food and nutrition security picture in many developing countries. A combination of both short- and long-term socioeconomic, health, political, demographic and environmental challenges affect food and nutrition security. These are all critical factors to consider when designing policies and programmes for improving nutrition outcomes.

Solutions to these issues are complex and not the responsibility of agriculture alone. Nevertheless agriculture plays a crucial role in mitigating each challenge. First, agriculture increases access to food, and is thus key to improving food and nutrition security. Second, agricultural development is crucial to alleviating poverty in developing countries where a large proportion of low-income communities depend upon the primary sector for their livelihoods. Third, agricultural policies focused on sustainable development practices have great potential to reduce some of the most harmful effects of the nutrition transition and other global trends. Fourth, nutrition-sensitive agricultural development is central to efforts to mainstream food and nutrition security considerations into national development agendas.

Some of the most important emerging themes for nutrition-friendly agriculture, essential as part of a broader nutrition-sensitive development framework, include:

- *Food production systems, social assistance, and other supportive policies and programmes in favour of low-income groups:* Increasing rural smallholder production and urban and periurban food systems are direct routes to improving food and nutrition security. The most important aspect of agricultural development in favour of low-income groups is that it expands, enhances and sustains people's ability to procure and use the amount and variety of food required to be active and healthy.
- *Environmental sustainability:* Improved agricultural production practices are essential to addressing environmental concerns such as biodiversity, sustainable use of resources, and livestock sector reform. Intercropping, integrated agro-forestry systems and cultivation of locally adapted varieties are examples.

- *Capacity-building to improve nutrition:* Agriculture is key to reducing both overnutrition and undernutrition. Strengthening national, municipal and community capacities to support local food systems and promote nutrition education and social marketing efforts is imperative to reducing all forms of malnutrition.
- *Setting higher standards in trade and development:* Agriculture has an important role to play in improving the international food and nutrition security environment. Responsible regulatory frameworks should include standard-setting for responsible foreign direct investment, as well as policies designed to protect and expand smallholder rights, increase incentives to produce and market micronutrient-rich foods, and prioritize the needs of low-income groups who are net consumers.

In conclusion, agriculture is fundamental to reducing global hunger, and along with the health and care-based approaches discussed in other chapters of this report, is integral to improving nutrition outcomes worldwide.