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General debate

Population, food security, nutrition and sustainable development

Report of the Secretary-General

Summary

In its decision 2018/101, the Commission on Population and Development decided that the special theme for its fifty-third session in 2020 would be “Population, food security, nutrition and sustainable development”. The present report has been prepared to inform the Commission’s deliberations on that theme.

The report contains a review of trends in indicators of food security and nutrition and of the relation of nutrition and food security to population health. It also covers the interrelationships of food security and sustainability with various aspects of population change.

* E/CN.9/2020/1.



I. Introduction

1. The question of how to feed a growing global population has been central to discussions around population and development for many decades. While the problem of undernutrition was highlighted in the Programme of Action of the International Conference on Population and Development, today's discussion of malnutrition is broader and includes stunting, wasting, overweight and obesity, as well as micronutrient deficiencies.

2. Five years after the International Conference on Population and Development, the General Assembly, in its resolution [S-21/2](#), adopted the key actions for the further implementation of the Programme of Action of the International Conference on Population and Development, in which measures to strengthen food, nutrition and agricultural policies and programmes, and fair-trade relations, with special attention to the creation and strengthening of food security at all levels, were called for. Emphasis was also placed on access to nutrition, health care and education for girls and young women.

3. The interrelationships between population, food security, nutrition and sustainable development involve more than a mere sufficiency of calories for a growing population. To ensure a healthy future for both people and planet, the growing population must be fed healthfully, equitably and sustainably. The Programme of Action also addressed sustainability, underlining that to achieve sustainable development and a higher quality of life for all people, Governments should reduce and eliminate unsustainable patterns of production and consumption.

4. Today, there is an increasing recognition of the challenges to food security posed not only by unsustainable production and consumption, but also by factors such as climate change, conflict and economic downturns. The 2030 Agenda for Sustainable Development highlights the interrelated nature of the 17 Sustainable Development Goals. In the *Global Sustainable Development Report 2019*, food systems and nutrition patterns are identified as a key transformative entry point for sustainable development. The focus should be on enabling more equitable global access to nutrient-rich foods and maximizing the nutritional value of produce, while also minimizing the impacts of food systems on climate and the environment.¹

5. In the present report, food security and nutrition are examined in the context of global population change.² According to United Nations projections, the world's population will increase from 7.7 billion in 2019 to 10.9 billion in 2100. The projections indicate that the global population is likely to stop growing sometime around 2100. There is, however, a wide range of uncertainty around the projected size of the world's population in 2100, with a 95 per cent prediction interval extending from 9.4 billion to 12.7 billion. There is considerable diversity among regions in current and future population trends, with the fastest population growth projected for sub-Saharan Africa, slower population growth projected for Asia and for Latin America and the Caribbean, and relatively little change in population numbers projected for Europe and North America combined.

6. Populations around the world are growing older on average owing to a combination of increasing life spans and declining levels of lifetime fertility. The number of people aged 60 years or older is projected to grow from 1.0 billion in 2020 to 1.4 billion in 2030 and 2.1 billion in 2050. Nonetheless, building for the future also

¹ Independent Group of Scientists appointed by the Secretary-General, *Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development* (New York, United Nations, 2019).

² For more information on global population trends, see [E/CN.9/2020/5](#).

requires sustained investment in the roughly 1.4 billion children who will be born between 2020 and 2030 and the 1.2 billion youth currently preparing to enter adult life.

7. Today, more than half of the world's population lives in urban areas, and that figure is projected to grow to about two thirds by 2050. This global trend has important implications, both for the food security of urban dwellers and for agricultural development and the livelihoods of rural populations.

8. In 2019, the number of international migrants worldwide reached nearly 272 million, up from 221 million in 2010; 44 per cent of international migrants live in the global South, and hundreds of millions more have migrated internally within their countries of birth. The global number of refugees and asylum seekers reached 29 million in 2019, an increase of nearly 14 million since 2010, accounting for about a quarter of the increase in the number of all international migrants. The number of people displaced within their countries as a result of violence and conflict also increased, reaching 41.3 million in 2018.³

II. Concepts, measures and state of food security and nutrition⁴

9. Target 2.1 of the Sustainable Development Goals is to end hunger and ensure access to safe, nutritious and sufficient food all year round for all people, in particular the poor and those in vulnerable situations, including infants. Target 2.2 is to end, by 2030, all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and to address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.

Food security

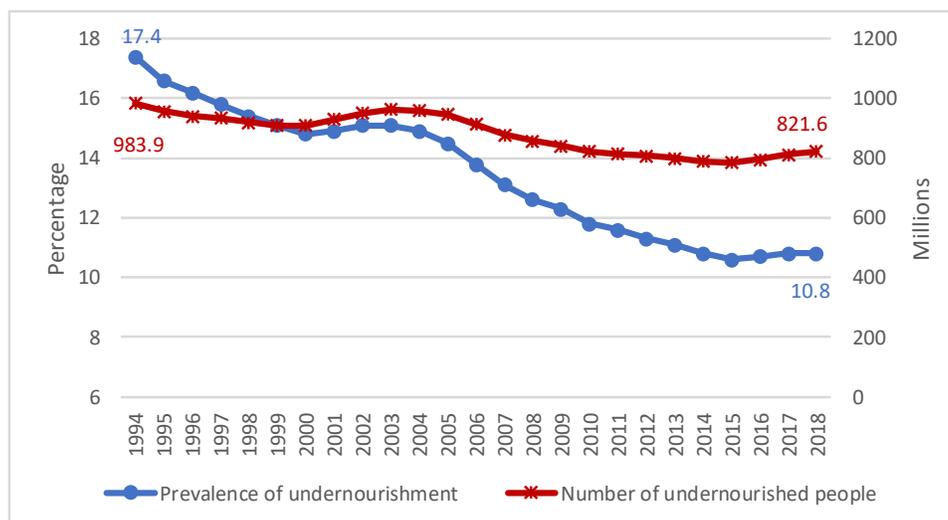
10. Food security exists when all people, at all times, have access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security implies the physical availability of food, access to food, ensured by favourable social and economic conditions, and proper utilization of food, as well as the stability of those three factors.

11. Indicator 2.1.1 of the Sustainable Development Goals, the prevalence of undernourishment, is an estimate of how many people lack sufficient dietary energy. Despite progress in reducing both the absolute number and the global prevalence of undernourishment in recent decades, in 2018, more than 820 million people, or 10.8 per cent of the global population, were undernourished. Furthermore, after more than a decade of steady decline, the number of undernourished people has been rising since 2015 and is now back to levels seen in 2010–2011 (see figure I). Droughts, conflict and economic crises are linked to rising levels of undernourishment in some cases. Africa has the highest prevalence of undernourishment, with one fifth of its population (more than 256 million people) affected. Asia, with a prevalence of 11 per cent, is home to the largest number of undernourished people (514 million).

³ Office of the United Nations High Commissioner for Refugees, *Global Trends: Forced Displacement in 2018* (Geneva, 2019).

⁴ This section is based on Development Initiatives, *2018 Global Nutrition Report: Shining a Light to Spur Action on Nutrition* (Bristol, United Kingdom of Great Britain and Northern Ireland, 2018); and Food and Agriculture Organization of the United Nations (FAO) and others, *The State of Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturns* (Rome, FAO, 2019).

Figure I
Global number and percentage of undernourished persons, 1994–2018



Source: FAO data.

Note: Values for 2018 are projected.

12. Indicator 2.1.2, the prevalence of moderate or severe food insecurity, is an estimate of how many people do not have access to nutritious and sufficient food owing to a lack of money or other resources. People experiencing moderate food insecurity face uncertainties about their ability to obtain food and may have been forced to compromise on the quality or quantity of the food they consume. People experiencing severe food insecurity have typically run out of food at some time during the year and may have gone for a day or more without eating. In 2018, approximately 700 million people worldwide suffered from severe food insecurity, and an additional 1.3 billion from moderate food insecurity. In Africa, more than 50 per cent of the population was either moderately or severely insecure.

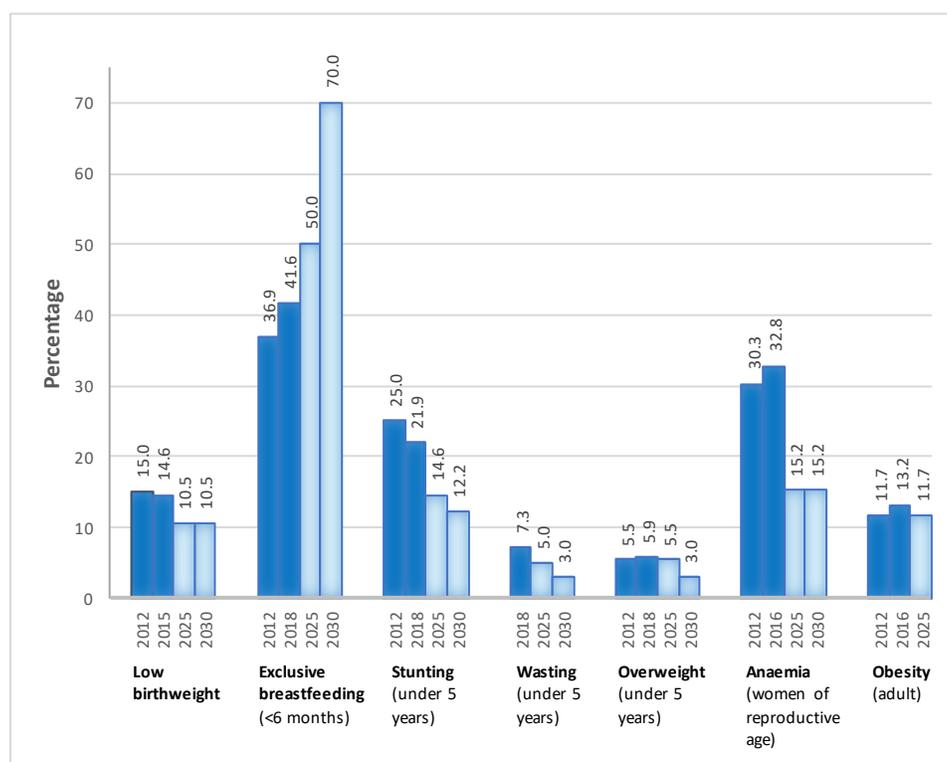
13. Gender dimensions of inequality affect food security and nutrition both within communities and within households. Food insecurity is slightly higher for women than for men, with the largest difference seen in Latin America. Globally, the gender gap in food insecurity is larger among the less-educated, poorer strata of the population, and in urban settings.

Nutrition

14. Progress on nutrition is not on track to meet globally agreed nutrition targets on childhood stunting, overweight, wasting, exclusive breastfeeding, low birth weight, and anaemia in women of reproductive age, which were set by the World Health Organization (WHO) to be achieved by 2025 (see figure II).⁵

⁵ WHO and the United Nations Children's Fund (UNICEF) subsequently proposed extending the deadline for the 2025 maternal, infant and young child nutrition targets to 2030 (WHO/UNICEF discussion paper, "The extension of the 2025 Maternal, Infant and Young Child nutrition targets to 2030").

Figure II
Global nutrition targets: Recent levels and trends, and targets for 2025 and 2030



Source: FAO and others, *The State of Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturns* (Rome, FAO, 2019), fig. 15.

Note: Observed levels and trends are shown in darker colour; targets for 2025 and 2030 in lighter colour.

15. The global prevalence of stunting (low height for age among children aged under 5) is decreasing, with 21.9 per cent affected in 2018 compared with 25.0 per cent in 2012. The number of stunted children has also decreased, from 165.8 million in 2012 to 148.9 million in 2018. Although this represents a 10.1 per cent reduction over a six-year period, it falls short of the pace of decline required to meet the 2030 target of reducing the number of stunted children by one half from the 2012 baseline. Although the prevalence of stunting is decreasing in almost every region, the extent of progress varies. Africa, with a stunting prevalence of 30 per cent in 2018, has seen the least progress since 2012. Africa and Asia accounted for more than 9 out of 10 stunted children globally.

16. Wasting (low weight for height among children aged under 5) is an indicator of acute malnutrition. Globally, in 2018, 7.3 per cent of children under the age of 5 suffered from wasting; the target is reducing childhood wasting and maintaining it at less than 5 per cent by 2025. In Asia and Oceania, nearly 1 in 10 children suffered from wasting in 2018; more than two thirds of all children suffering from wasting lived in Asia.

17. In 2015, an estimated 14.6 per cent of babies born worldwide had low birthweight, with wide variation across regions, from 7.0 per cent in North America and Europe to 17.3 per cent in Asia. As seen in figure II, little progress had been made since 2012. If that trend continues, the goal set by WHO of achieving a 30 per cent reduction in the prevalence of infants with a low birthweight by 2025 will not be met.

18. In 2016, one in three women of reproductive age (aged 15–49) worldwide were affected by anaemia. The prevalence of anaemia among women of reproductive age in Africa and Asia was more than double the level in North America and Europe. Since 2012, the global prevalence of anaemia has risen slightly, making it unlikely that the WHO target of a 50 per cent reduction from the 2012 level will be achieved by 2025.

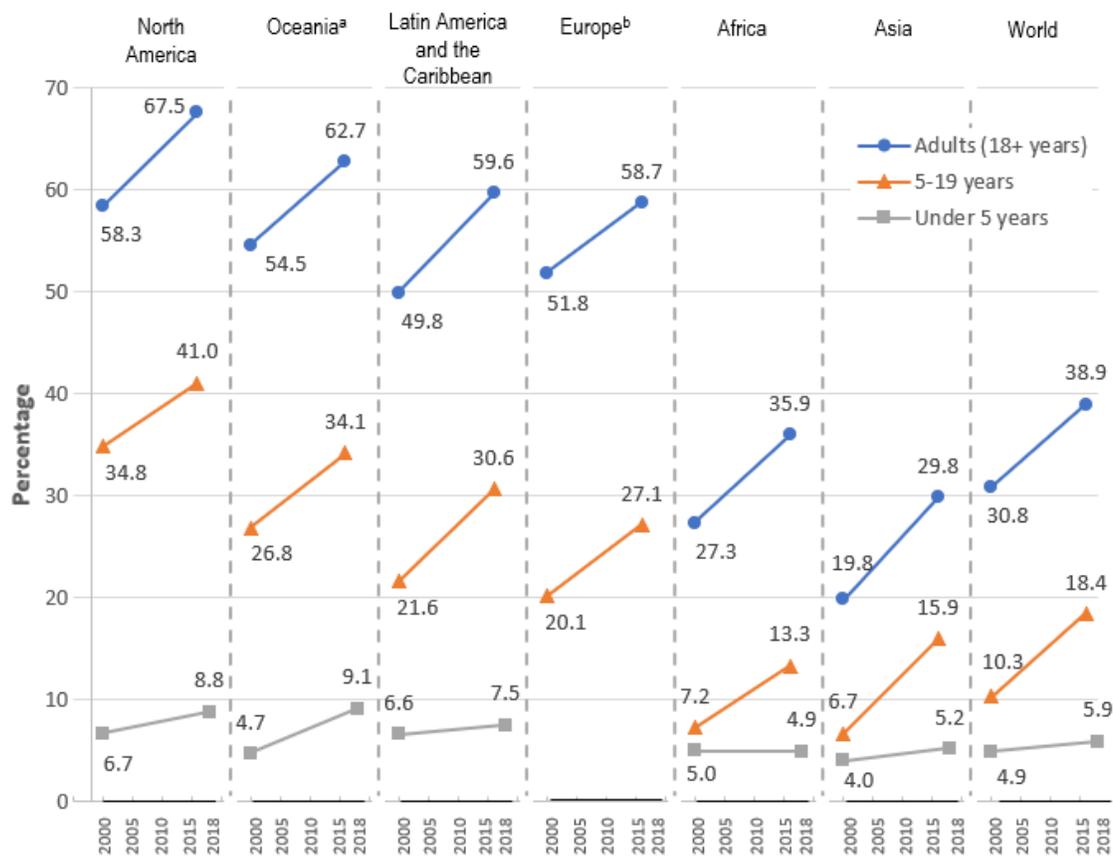
19. Estimates of exclusive breastfeeding reveal some progress at the global level, with 41.6 per cent of infants under 6 months of age being exclusively breastfed in 2018 compared with 36.9 per cent in 2012. In 2018, Africa and Asia had the highest prevalence of exclusive breastfeeding, with more than two in five infants aged under 6 months benefiting from this life-saving practice.

20. In 2018, 40.1 million children under the age of 5 worldwide were overweight. The global prevalence of overweight among children under the age of 5 increased from 5.5 per cent in 2012 to 5.9 per cent in 2018. While Asia and Africa had the lowest overweight prevalence in 2018 (5.2 and 4.9 per cent, respectively), together they accounted for nearly three quarters of all overweight children aged under 5 in the world. Oceania had the highest prevalence of overweight, with almost 1 in 10 children aged under 5 (9.1 per cent) affected. This region is an example of a population affected by the double burden of under- and over-nutrition, with prevalence of both acute malnutrition and overweight among children aged under 5 approaching the 10 per cent threshold for categorization as a high level.⁶

21. The prevalence of overweight and obesity has risen rapidly since 2000 among older children, adolescents and adults. Globally in 2016, 20.6 per cent of children aged 5–9 and 17.3 per cent of adolescents (aged 10–19) were overweight, or 131 million children aged 5–9 years and 207 million adolescents. In the same year, nearly two in five adults (those aged 18 or older) (38.9 per cent) were overweight, representing 2 billion adults worldwide. Over half of adults and over one quarter of school-age children in North America, Oceania, Latin America and the Caribbean, and Europe were overweight in 2016 (see figure III). Adult obesity continues to rise globally, from 11.7 per cent in 2012 to 13.2 per cent in 2016, and is more common among women than men (15.1 compared with 11.1 per cent in 2016). No country is currently on track to meet the WHO target, adopted in 2013, of halting the rise in adult obesity.

⁶ Mercedes de Onis and others, “Prevalence thresholds for wasting, overweight and stunting in children under 5 years”, *Public Health Nutrition*, vol. 22, No. 1 (January 2019).

Figure III
Percentage of overweight persons in three age groups, for the world and by region, 2000–2018



Source: FAO and others, *The State of Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturns* (Rome, FAO, 2019), fig. 18.

Notes: Regions are shown in order of the level of overweight among adults at the most recent date. Estimates for children aged under 5 are based on data for 2000 and 2018; for other age groups, on data for 2000 and 2016.

^a Estimates for children aged under 5 in Oceania exclude Australia and New Zealand.

^b Estimates for children aged under 5 in Europe are not shown owing to insufficient population coverage.

III. Nutrition, food security and population health

A. Diets, nutritional habits and burden of disease

22. Different forms of malnutrition often occur in combination: among countries with data available on childhood stunting, anaemia in women of reproductive age and overweight among all adult women, 88 per cent have recently exhibited a high level of at least two of these forms of malnutrition.⁷ A key contributor to malnutrition is unhealthy diets. Current food systems are not delivering the diets needed for optimal health, from resource-poor and fragile contexts in which access to sufficient food may be the principal challenge, to high-income countries⁸ where social, cultural and

⁷ Development Initiatives, *2018 Global Nutrition Report*.

⁸ For income categories, see the classification of countries by the World Bank (<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>).

economic drivers often lead to unhealthy food choices. Although diets are becoming more diversified globally,⁹ they often do not meet the criteria for a healthy diet.

23. Two important drivers of recent dietary shifts have been increased incomes and urbanization. Although rising incomes in low- and middle-income countries have led to greater demand for nutrient-rich foods such as fruits, vegetables, wholegrains, meat, seafood, dairy and eggs, there has been a parallel – and more rapid – increase in the consumption of processed foods and beverages, which tend to be rich in calories but poor in nutrients. A recent analysis of over 23,000 widely marketed packaged food products showed that 69 per cent had relatively poor nutritional quality and that the proportion of nutrient-poor products was higher in low- and middle-income than in high-income countries.¹⁰ While per capita consumption of packaged foods was greater in the latter, the former were catching up rapidly.

24. In countries that have experienced rapid economic development, the shift towards high-calorie but nutrient-poor diets initially affected urban areas, which offer a greater range of food choices, including “convenience” foods. Since urban lifestyles also require less dietary energy – with a reduction of physical activity of 10–15 per cent compared with rural work – obesity and diabetes in low- and middle-income countries initially advanced more rapidly in cities than in rural areas. More recently, however, available evidence suggests that changes in rural areas have become the main driver of the global increase in adult obesity.¹¹

25. Unhealthy diets are now responsible for more adult deaths and disability worldwide than tobacco use. In 2017, 11 million adult deaths were attributable to dietary risk factors. Cardiovascular disease was the leading cause of diet-related deaths, followed by cancers and type 2 diabetes. High intake of sodium and low intake of whole grains and fruits were the leading dietary risk factors for deaths and disability globally.¹²

26. Poor diet quality is also evident in the feeding of infants and young children. Despite the recent increase in the practice of exclusive breastfeeding, many young children still receive a suboptimal diet, and sales of infant formula are growing rapidly. Worldwide, only 16 per cent of children aged 6–23 months eat a minimally acceptable diet, and only half eat the recommended minimum number of meals. While there are differences across countries and income groups and between rural and urban settings, poor feeding practices of infants and young children are found throughout the world.¹³

B. Hunger and undernutrition

27. Undernutrition often begins in utero and extends through childhood and into adult life. It also spans generations, as poorly nourished girls are at higher risk of suffering malnutrition as adult women; maternal undernutrition can lead to fetal growth restriction and preterm birth, and it increases the risk of maternal and infant mortality (see figure IV). Although good nutrition in later childhood and adolescence

⁹ William A. Masters. “Assessment of current diets: recent trends by income and region”, Working Paper No. 4 (2016); and John Kearney, “Food consumption trends and drivers”, *Philosophical Transactions of the Royal Society B*, vol. 365 (2010), pp. 2793–2807.

¹⁰ Development Initiatives, *2018 Global Nutrition Report*.

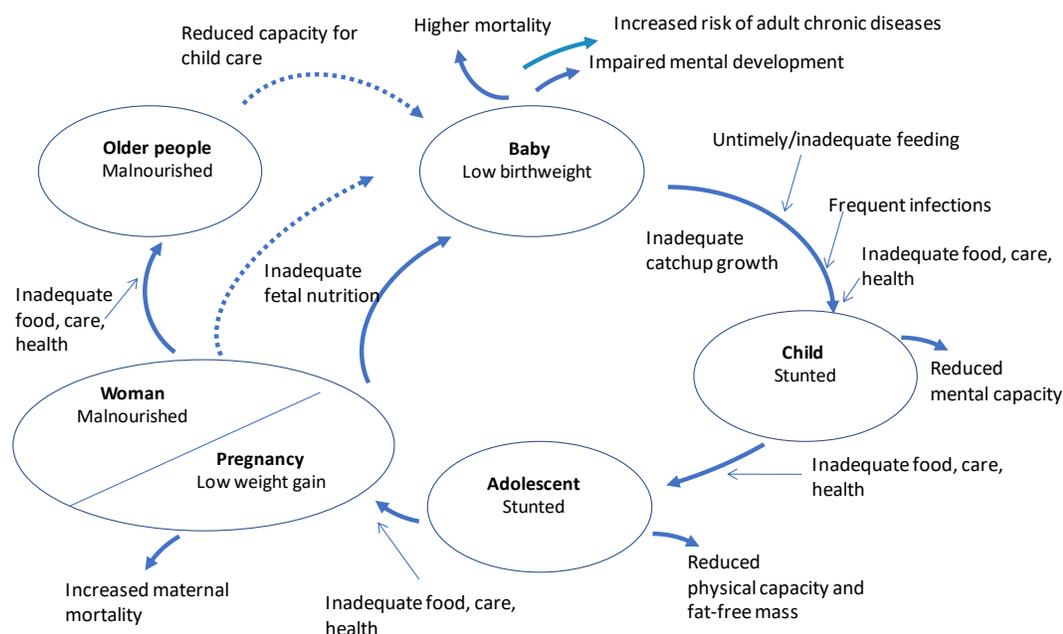
¹¹ Honor Bixby and others, “Rising rural body-mass index is the main driver of the global obesity epidemic in adults”, *Nature*, vol. 569, No. 7755 (May 2019).

¹² Global Burden of Disease 2017 Diet Collaborators, “Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017”, *The Lancet*, vol. 393, No. 10184 (May 2019).

¹³ Development Initiatives, *2018 Global Nutrition Report*.

can partially compensate for earlier deficits, research confirms that sound nutrition during pregnancy and through the first two years of life is crucial for optimal child development.¹⁴

Figure IV
Interlinkages and impacts of malnutrition over the life cycle



Source: United Nations Administrative Committee on Coordination, Subcommittee on Nutrition, *Fourth Report: the World Nutrition Situation – Nutrition Throughout the Life Cycle* (Geneva, 2000).

28. The immediate causes of child undernutrition are inadequate food intake and disease. Those problems are influenced by intermediate and more basic causes, including food insecurity, lack of adequate care – including medical care – for women and children, unsanitary conditions, inadequate education, poverty and gender inequality. While infectious disease contributes to undernourishment, undernourished children are also at elevated risk of succumbing to such diseases. Undernutrition is responsible for around 45 per cent of deaths among children aged under 5, including the joint effects of fetal growth restriction owing to maternal undernutrition, suboptimum breastfeeding, stunting, wasting and deficiencies in vitamin A and zinc.¹⁵

29. Childhood stunting leads to shorter adult stature, and stunted children have a higher risk of becoming overweight or obese as adults. Stunting is also associated with lower economic productivity and earning capacity, poorer pregnancy outcomes, a higher risk of metabolic and cardiovascular diseases later in life and lower IQ and overall cognitive capacity.

30. Chronic undernutrition can delay physical maturation and extend the adolescent growth period, which, in girls, may overlap with the first pregnancy. Approximately 12 million girls aged 15–19 give birth each year in low- and middle-income countries,¹⁶ and many marry and become pregnant before they are physically mature.

¹⁴ Robert E. Black and others, “Maternal and child undernutrition and overweight in low-income and middle-income countries”, *The Lancet*, vol. 382, No. 9890 (August 2013).

¹⁵ Ibid.

¹⁶ United Nations, World Population Prospects: The 2019 Revision Population database, available at <https://population.un.org/wpp/>.

This usually means inadequate nutrient availability for both mother and fetus and leads to reduced adult stature of young mothers. Efforts to increase education, prevent child marriage, reduce adolescent pregnancy and improve access to family planning can help reduce these risks to women's and children's health.

31. Across populations there are severe data gaps around the prevalence of micronutrient deficiencies and the consequences of such deficiencies for health and disease. The micronutrients of greatest concern, particularly in low- and middle-income countries, are iron, zinc, vitamin A, folate and iodine, as requirements for these are the most difficult to satisfy without diverse diets. Anaemia can be caused by the deficiency of one or more micronutrients, and several diseases can contribute to anaemia and exacerbate its effects.¹⁷ Anaemia increases the risks of maternal mortality and fetal growth restriction. Iron-deficiency anaemia is especially common among young women in middle-to-late adolescence.¹⁸

32. For older persons, outcomes of poor nutrition in early life may manifest in non-communicable diseases later in life. Additionally, age-related health conditions such as reductions in taste and smell, dental problems or loss of appetite may interfere with nutritional intake, and older persons with limited mobility and insufficient social support may have trouble obtaining sufficient amounts of nutritious food.¹⁹

C. Overweight and obesity

33. Changes in the food environment and food systems have been major drivers of the rise in overweight and obesity over the last few decades; sedentary lifestyles have also contributed. Childhood overweight and obesity impair health both during childhood and later in life, and overweight children are more likely to be overweight as adults. Overweight and obesity in children are associated with negative social and psychological outcomes, poorer school attendance and achievement, and lower employment prospects and earnings as adults.

34. Obesity contributes to chronic diseases that raise risks of death and disability, add to health-care costs and lead to unemployment and loss of household income. Such problems make it harder for households to escape poverty, undermine national development efforts and strain health-care systems. In 2017, approximately 8 per cent of all deaths globally were attributable to overweight and obesity.²⁰ Excessive weight substantially increases the risks of death and disability from cardiovascular disease, diabetes and some cancers and is also a major risk factor for disabling musculoskeletal disorders later in life, especially osteoarthritis.²¹ Obese women who become pregnant face elevated risks to their own health, including from gestational diabetes, and their children are at higher risk of becoming obese.

¹⁷ Development Initiatives, *2018 Global Nutrition Report*.

¹⁸ Nadia Akseer and others, "Global and regional trends in the nutritional status of young people: a critical and neglected age group", *Annals of the New York Academy of Sciences*, vol. 1393, No. 1 (April 2017).

¹⁹ Julie Shlisky and others, "Nutritional considerations for healthy aging and reduction in age-related chronic disease", *Advances in Nutrition*, vol. 8, No. 1 (January 2017).

²⁰ Global Burden of Disease 2017 Risk Factor Collaborators, "Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017", *The Lancet*, vol. 392, No. 10159 (November 2018).

²¹ WHO, "Obesity and overweight", 16 February 2018.

35. Although it is beyond the scope of the present report to review policies and programmes to combat malnutrition,²² there is a broad consensus that tackling all forms of malnutrition is not the domain of any one sector alone: the health, education, agriculture, social protection, planning and economic policy sectors all have a role to play, as do legislators and other political leaders. A range of actions is needed, aimed at the individual, household, community, national and even global levels.²³

IV. Food security and population change

A. Population growth, food consumption and sustainability

36. Over recent decades, the increase in agricultural production has more than kept up with population growth, and inflation-adjusted food prices have declined. However, these favourable trends have come with high costs to the environment, raising questions about the sustainability of food and agricultural systems. Key challenges for moving such systems towards sustainability include: (a) reliably providing sufficient, safe and nutritious food and other agricultural products to meet growing and changing demands; (b) eliminating hunger, food insecurity and malnutrition; (c) preserving the condition and enhancing the productivity of natural ecosystems; and (d) mitigating and adapting to climate change.²⁴

37. Continued population growth will substantially increase the demand for food by 2050, especially in sub-Saharan Africa and South Asia. Food demand will also be influenced by the gradual ageing of human populations and by urbanization. Between 2015 and 2050, the number of people aged 15–24 in low- and middle-income countries is projected to rise from 1 billion to about 1.2 billion, while most high-income countries will have rapidly ageing populations. Africa and Asia are urbanizing more rapidly than other world regions, with the highest rates of net rural-to-urban migration. The different food requirements of young and old people, as well as the different consumption patterns, jobs and living conditions of urban and rural populations, will affect the demand for various types of food and minimum dietary energy requirements. Population dynamics will thus be a critical determinant of future food demand.²⁵

38. Increasing per capita income also contributes to rising food demand, as diets change to include both more calories and more varied and expensive foods. Global per capita income is currently more than \$11,000 per year, or twice the 1970 level. However, there are marked differences between countries. In high-income countries, the average per capita income is above \$40,000, compared with around \$4,000 in low- and middle-income countries, excluding China (it is \$7,200 in China). Although prospects for economic growth are highly uncertain, if per capita income in these countries were to grow rapidly in future years, food demand could increase substantially. Income growth in many low- and middle-income countries has given rise to a middle class with increasing preferences for meat, fish, dairy products and other resource-intensive items, and for foods that are high in sugar, salt and fats. These changes may signal a global convergence towards the consumption habits

²² For more information on this subject, see the report of the Secretary-General on the monitoring of population programmes, focusing on population, food security, nutrition and sustainable development (E/CN.9/2020/3).

²³ FAO and others, *The State of Food Security and Nutrition in the World*.

²⁴ FAO, *The Future of Food and Agriculture: Trends and Challenges* (Rome, 2017).

²⁵ Ibid.

prevailing in Western Europe and North America, with negative implications for the incidence of overweight, obesity and associated non-communicable diseases.²⁶

39. Although food systems produce enough food to feed the global population, many individuals lack the financial means to purchase a sufficient quantity and variety of foods. Highly unequal income distribution within countries and substantial differences in per capita income levels between low-, middle- and high-income countries help to perpetuate poverty and privation, making it more difficult to reach targets for food security and nutrition. The ratio of per capita income in low- and middle-income countries (excluding China) relative to high-income countries was about 9 per cent between 1970 and 2014, with almost no convergence between the two groups. Without convergence, very high per capita income differentials between countries could persist for decades, with potentially negative consequences for business investment, asset ownership, employment and, ultimately, population health and well-being.²⁷

40. Agricultural production more than tripled between 1960 and 2015, outpacing population growth, owing to both increased crop yields and expansion of agricultural land. However, food systems are increasingly vulnerable as a result of the pressure they exert on natural ecosystems and the services they provide. More than 80 per cent of agricultural production goes towards food consumption, either directly or, indirectly, through crops used to produce animal feed. Food production currently occupies 50 per cent of the earth's habitable land, accounts for 70 per cent of freshwater consumption and produces around a quarter of global greenhouse gas emissions. High concentrations and mismanagement of pesticides and antibiotics, particularly in the livestock sector, have led to the evolution and spread of antibiotic-resistant bacteria, threatening human health and the sustainability of production systems. Food production is also a major driver of biodiversity loss and of air and water pollution, often linked to poorly managed chemicals, deforestation and soil degradation. Habitat loss and pesticides are harming pollinators, with negative implications for important crops, while water scarcity is limiting the expansion of irrigation in some regions. Plastic waste, of which a significant amount originates in food production and packaging, constitutes 75 per cent of marine litter. Such litter hosts unique microbial communities, is a potential vector for disease and invasive alien species crossing oceans and lakes and is harmful to fish, which ingest it.²⁸

41. Climate change already affects food security through changing precipitation patterns and an increased frequency of extreme events, such as heatwaves, floods and droughts. The impacts are especially severe in low- and middle-income countries, where many people depend on agriculture for their livelihoods and where food security and adaptive capacity are low. For instance, climate change has resulted in slower animal growth rates and lower productivity of pastoral systems in Africa. Furthermore, higher atmospheric CO₂ levels lower the protein and micronutrient content of grains and legumes.²⁹ Over recent decades, in many lower-latitude regions, some crop yields (e.g., maize and wheat) have been negatively affected, while in many higher-latitude regions, yields (e.g., maize, wheat and sugar beets) have been positively affected. These differential impacts of climate change shift assets and opportunities across geographical regions, with implications for the future stability of food systems.

²⁶ Ibid.

²⁷ FAO, *The Future of Food and Agriculture: Alternative Pathways to 2050* (Rome, 2018).

²⁸ United Nations Environment Programme, *Global Environmental Outlook: GEO 6 – Healthy Planet, Healthy People* (Cambridge, Cambridge University Press, 2019).

²⁹ Ibid.

42. The demand for crops to produce biofuels and other non-food items is rising. This trend intensifies the competition between food and non-food uses of crops, increases risks of desertification and land degradation, and threatens food security. Experience has shown that there are limits and drawbacks to the deployment of land-based measures for the mitigation of climate change, such as bioenergy crops or afforestation.³⁰

43. Analyses of future food and agricultural systems build upon scenarios designed to support the fifth assessment report of the Intergovernmental Panel on Climate Change. FAO has designed three scenarios for food and agriculture before 2050: (a) “Business as usual”, which is characterized by a continuation of recent trends and a failure to address outstanding challenges facing food and agriculture, including climate change; (b) “Towards sustainability”, which is characterized by proactive policies to promote sustainable food and agricultural systems, accompanied by efforts to mitigate climate change; and (c) “Stratified societies”, which is characterized by increased inequalities between and within countries, limited innovation and intensified climate change.³¹

44. The FAO findings highlight that global agricultural production will need to increase to satisfy additional demand resulting from population and income growth. The extent of such an increase, however, depends on dietary choices.³² The increase in agricultural output – and associated natural resource consumption and greenhouse gas emissions – can be significantly limited by, inter alia, reducing the consumption of meat and other livestock-based products, particularly in high-income countries and China, along with reducing food losses and waste in post-harvest storage, processing, distribution and consumption.

45. More balanced diets would also have beneficial effects on health, as discussed above. A consistent result from many scenario analyses, globally and across country groups, is that a “business as usual” scenario would lead to significant undernourishment and malnutrition by 2050. Levels of undernourishment and malnutrition could even increase if there were a further deterioration in income inequality, employment and income-earning opportunities, or access to basic services.³³ Since 2012, the baseline year of the FAO projections, the global prevalence of undernutrition has followed a path close to that of the worst-case (stratified societies) scenario (see figure V).

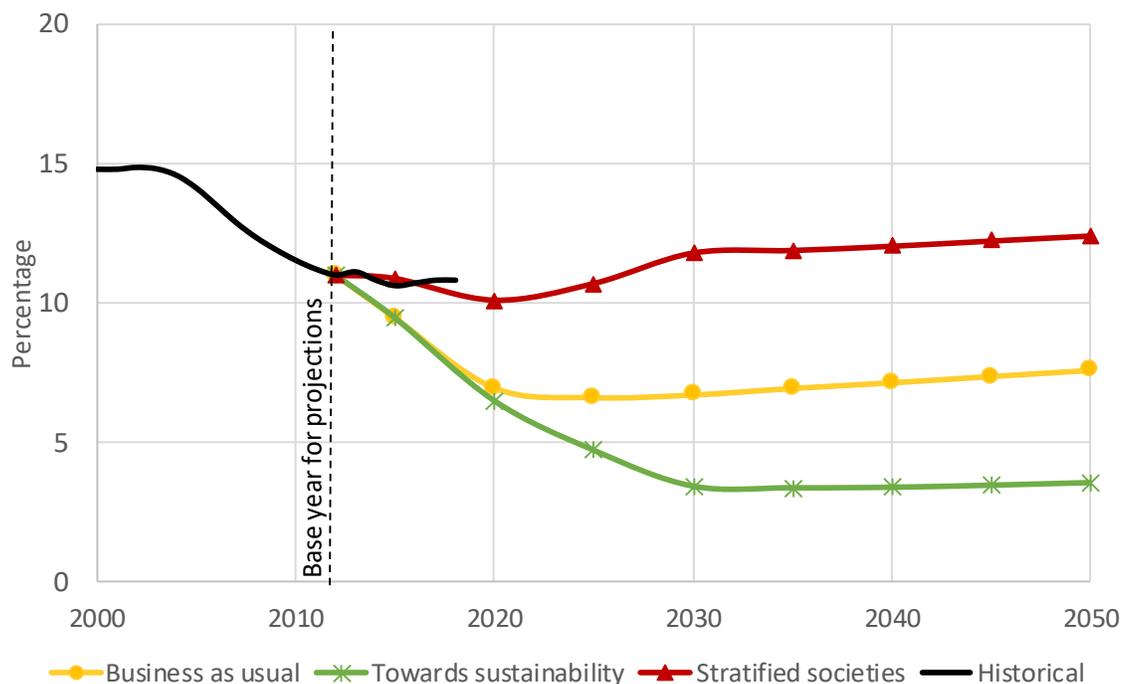
³⁰ Intergovernmental Panel on Climate Change, *Special Report on Climate Change and Land: Summary for Policymakers* (Geneva, 2019).

³¹ All the scenarios assume that future population change will follow the medium variant of the United Nations projections. The scenarios take into account the changing calorie requirements implied by projected changes in population age structures.

³² FAO, *The Future of Food and Agriculture: Alternative Pathways to 2050*; Cheikh Mbow and others, “Food security”, in Intergovernmental Panel on Climate Change, *Special Report on Climate Change and Land*; and Cynthia Rosenzweig and others, “The Agricultural Model Intercomparison and Improvement Project (AgMIP): protocols and pilot studies”, *Agricultural and Forest Meteorology*, vol. 170 (March 2013), pp. 166–182.

³³ FAO, *Alternative pathways to 2050*.

Figure V
Global prevalence of undernourishment, 2000–2050



Sources: Historical data for 2000 to 2012 based on FAO and others, *The State of Food Security and Nutrition in the World: Building Resilience for Peace and Security* (Rome, 2017); historical data for 2013 to 2018 based on FAO and others, *The State of Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturns* (Rome, 2019); and scenario projections drawn from FAO, *The Future of Food and Agriculture: Alternative Pathways to 2050* (Rome, 2018).

46. In moving towards sustainable food and agricultural systems, food prices would likely increase if all production and consumption costs were taken into account, including resource degradation and greenhouse gas emissions. While price increases reflecting these externalities could lead to a more careful use of natural resources, including reductions in food waste and restrained food demand, they could simultaneously limit access to food among the poor. Yet, environmental sustainability, food security and better nutrition can be achieved, as shown by scenario analyses, with a more equitable distribution of income and food within and across countries.³⁴ Indeed, more equitable distributions of income and food could help in reducing both undernourishment and overnutrition.³⁵

47. In the Programme of Action of the International Conference on Population and Development, it was recognized that efforts to slow population growth, reduce poverty, achieve economic progress, improve environmental protection and reduce unsustainable consumption and production patterns were mutually reinforcing. It was noted that slower population growth could improve countries' ability to attack poverty, protect and restore the environment, and build the base for future sustainable development (para. 3.14). Going forward, it is expected that the annual increase in the global population will diminish, gradually reducing the role of population as a

³⁴ Ibid.

³⁵ Tomoko Hasegawa and others, "Risk of increased food insecurity under stringent global climate change mitigation policy", *Nature Climate Change*, vol. 8, No. 8 (August 2018); and Tomoko Hasegawa and others, "Tackling food consumption inequality to fight hunger without pressuring the environment", *Nature Sustainability*, vol. 2, No. 12 (December 2019).

driver of increased food production. Nevertheless, future population growth will have a major impact on the total demand for food in 2050 and beyond, and it would be easier to meet that demand if population growth decelerated more rapidly than is currently anticipated.

48. The challenge of ensuring sufficient access to food will be greatest in sub-Saharan Africa, where a high rate of population growth and high levels of undernutrition at present mean that the food supply will need to increase much more rapidly than in other regions. Whereas the FAO “business as usual” scenario would lead to a 50 per cent increase in agricultural production globally between 2012 and 2050, in sub-Saharan Africa, production would need to increase by about 150 per cent.

49. Slower population growth in sub-Saharan Africa would alleviate some of the need for increased food production over the coming decades. This would require an accelerated decline of fertility in the region, which may be achievable through measures to increase women’s access to education, formal employment and family planning. It is estimated that, in 2019, 17 per cent of women of reproductive age (15-49 years) in sub-Saharan Africa had no access to contraception, despite wishing to stop or delay childbearing, compared with 10 per cent globally.³⁶ Rights-based approaches that focus on ensuring universal access to sexual and reproductive health care, protecting reproductive rights and eliminating child, early and forced marriages could bring about a more rapid fertility decline by giving women greater control over the number and spacing of their children.

B. Rural development, population movements and settlement patterns

50. The conventional wisdom is that development, led by economic growth, progresses through stages. From traditional societies, characterized by a high share of value produced and labour employed in agriculture, countries transition to an economy in which the manufacturing and services sectors are prominent, with lower levels of employment in agriculture, a specialized labour force and greater reliance on technological processes. Intermediate stages involve a structural transformation across all economic sectors, including agriculture. Farms shift from multi- to single cropping, become larger, more specialized and integrated into markets, adopt “modern” agricultural technologies and enjoy economies of scale. Farmers who stay in agriculture earn higher incomes, while others move away from rural areas and take higher-paying jobs in other sectors.

51. This conventional wisdom derives from a retrospective analysis of high-income countries, where average farm size has been increasing. However, in many low- and middle-income countries, the average farm size has been decreasing, calling into question the applicability of the conventional perspective for understanding ongoing economic transformations in these countries.³⁷ Moreover, in recent decades, divergence from the conventional pattern has been reflected also in the wage gap between agriculture and other sectors of the economy (the “urban premium”), which shrank significantly in high-income countries but has decreased only slightly in sub-Saharan Africa and has increased dramatically in Asia. Concurrently, the number of workers in agriculture increased substantially in both sub-Saharan Africa and

³⁶ United Nations, Department of Economic and Social Affairs, Population Division, Estimates and Projections of Family Planning Indicators 2019 database, available at www.un.org/en/development/desa/population/theme/family-planning/cp_model.asp.

³⁷ FAO, *The State of Food and Agriculture: Leveraging Food Systems for Inclusive Rural Transformations* (Rome, 2017), p. 54.

Asia,³⁸ while the share of employment in agriculture in low-income countries declined only modestly, from 71 per cent in 1991 to 63 per cent in 2018.³⁹ At the same time, high-input, resource-intensive, monocrop “modern” agriculture has brought unsustainable environmental impacts.

52. The manufacturing sector has traditionally absorbed excess labour freed by agricultural development, while the overall productivity of labour increased. This has occurred more recently in China, the Republic of Korea and elsewhere. In many low- and middle-income countries, however, manufacturing is not playing the same role. The manufacturing, agrifood and service sectors are themselves undergoing capital intensification through the adoption of information technologies (robotics, digitalization and artificial intelligence) that reduce the need for workers. Concurrently, the digital technology needs of low- and middle-income countries depend increasingly on oligopolistic markets for big-data platforms, where a small number of corporations manage extraordinary amounts of information on production and consumption processes.⁴⁰ The implications of these technological dynamics for economic growth and reduction of poverty and income inequality have not been fully explored. The evidence to date shows that in Africa, for instance, most of the jobs being created are in low-productivity sectors, such as traditional informal services lacking decent working conditions. Rural transformation and urbanization have so far been occurring with almost no increases in productivity.⁴¹

53. Semi-rural and peri-urban areas play an important role in food production. In Latin America, where about 80 per cent of the population lives in urban areas, between 30 and 70 per cent of urban households participate in agricultural activities for self-consumption or petty trade, generating around 15 per cent of household income. The situation is similar in Eastern Europe. In Africa and in some Asian countries, where the boundaries and definitions of cities are less clear, between 10 and 35 per cent of urban households are engaged in agriculture, producing from 10 to 70 per cent of household income.⁴² Nevertheless, it is expected that food will continue to be produced predominantly in rural areas, which need to be linked through both physical and digital infrastructure with towns and small cities, where food-storing and food-processing activities can generate additional employment.⁴³ Access to improved storage facilities would be especially valuable for smallholders in sub-Saharan Africa, where post-harvest loss is common and food safety surveillance remains an issue.⁴⁴

54. Prospects for achieving food security and moving agricultural systems towards sustainability will depend largely on today’s rural youth and the effectiveness of

³⁸ High-Level Panel of Experts on Food Security and Nutrition, *Investing in Smallholder Agriculture for Food Security: A Report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security* (Rome, 2013); Bruno Dorin, Jean-Charles Hourcade and Michel Benoit-Cattin, “A world without farmers? The Lewis path revisited”. CIRED Working Papers, No. 47-2013 (Paris, International Research Centre on Environment and Development, 2013).

³⁹ International Labour Organization, World Employment and Social Outlook Data Finder database, available at www.ilo.org/wesodata/ (accessed on 23 October 2019).

⁴⁰ CEB/2019/1/Add.2.

⁴¹ Aidar Abdychev and others, “The future of work in sub-Saharan Africa”, African Department Paper Series, No. 18/18 (Washington, D.C., International Monetary Fund, 2018).

⁴² Alberto Zezza and Luca Tasciotti, “Urban agriculture, poverty, and food security: empirical evidence from a sample of developing countries”, *Food Policy*, vol. 35, No. 4 (August, 2010), pp. 265–273.

⁴³ FAO, *The State of Food and Agriculture: Leveraging Food Systems for Inclusive Rural Transformations*.

⁴⁴ Megan Sheahan and Christopher B. Barrett, “Review: food loss and waste in sub-Saharan Africa”, *Food Policy*, vol. 70 (July 2017).

policies and programmes to support their participation in rural development. Rural youth have limited access to productive resources, including land, capital, credit, technology, markets, information, education and training. Young women have even more limited access than young men. Young people are approximately three times more likely than adults to be unemployed. These constraints reinforce other factors pushing rural youth to move to urban areas or abroad, resulting in the loss of a vital part of the rural workforce. The lack of resources and opportunities for youth in both rural and urban areas may have disruptive long-term impacts, including poorly managed international migration and social unrest.

55. Efforts to improve rural livelihoods should also strive to increase women farmers' access to productive resources for raising agricultural output. Women make up over 40 per cent of the agricultural labour force globally, and half or more in many African and Asian countries. However, women often have less access than men to fertilizer, improved seeds, technical assistance and market information, and they often possess limited property rights.

56. Ongoing transformations in agricultural sectors and rural societies and growing environmental constraints push people to move between rural areas, from rural to urban areas, or between countries in search of better opportunities. Much migration is temporary and often seasonal. In low-income countries, rural-to-rural migration dominates migration flows from rural areas of origin, and this often coincides with a shift away from agriculture as a principal source of income. Increased population density and the growth of towns and smaller cities in areas that are predominantly rural help to strengthen the connections between urban and rural communities.⁴⁵

57. Migration decisions are complex and depend on multiple factors. Migration is partly a response to "push" factors, including limited opportunities for earning a decent income, ill-functioning labour and credit markets and a lack of basic services and infrastructure. Environmental factors may contribute as well; for example, people may move in response to deteriorating soil quality or water supplies or to escape extreme weather events.⁴⁶ Conflicts, risks, shocks, extreme poverty and food insecurity often exacerbate these problems. Migration is also a response to "pull" factors, such as better employment and income opportunities, family connections and lifestyle choices in the destination. Migration is often an important element of household strategies to increase or diversify sources of income.

58. Available data, though limited, suggest that a significant share of international migrants from low- and middle-income countries come from rural areas. Rural areas are also destinations for many international migrants, who play an important role in supporting agriculture and rural economies in high-income countries. Economic and social challenges arise when populations in receiving countries perceive international migrants as competing for jobs and as a threat to their wage level. Evidence indicates that this perception is sometimes justified for low-skill jobs but, more often, migrants appear to have a minimal effect on the wages and employment prospects of native workers.⁴⁷ Given the ageing of human populations, which has been accelerated by very low birth rates in many high-income countries, migration provides benefits for destination communities, including by relieving labour shortages.

59. Concurrently, diasporas provide financial support to origin areas through remittances, which help migrant-sending households to manage risks, cope with

⁴⁵ International Fund for Agricultural Development, *Creating Opportunities for Rural Youth: 2019 Rural Development Report* (Rome, 2019).

⁴⁶ Kanta Kumari Rigaud and others, *Groundswell: Preparing for Internal Climate Migration* (Washington, D.C., World Bank, 2018).

⁴⁷ FAO, *The State of Food and Agriculture: Migration, Agriculture and Rural Development* (Rome, 2018).

shocks and finance investments. They also build networks that assist others to migrate. In 2018, estimated remittance flows to low- and middle-income countries reached \$526 billion, an increase of 8.6 per cent over 2017, and flows in 2019 are likely to reach \$551 billion, exceeding foreign direct investment and official development assistance flows to those countries. Remittance flows grew in all regions but especially in South Asia, Europe and Central Asia. Sub-Saharan Africa, however, appears to benefit much less from migrant remittances compared with other regions.⁴⁸

V. Conclusions and recommendations

60. **A key conclusion of this report is that the world is not on track to eliminate hunger by 2030. After decades of progress, the number of undernourished persons worldwide has increased in recent years. Another key conclusion is that the current global food system is environmentally unsustainable. A more sustainable future is attainable but will require transformations in food supply and demand as well as institutional reforms and strengthened efforts to preserve the natural resource base and mitigate climate change.**

61. **The world's population must be well nourished and healthy to achieve the goals and objectives of the Programme of Action of the International Conference on Population and Development and all 17 of the Sustainable Development Goals. Achieving sustainable food systems and healthy diets will require addressing interrelated challenges in multiple domains, including water and sanitation, health care, education, social protection and employment.**

62. **Population growth is an important driver of increased food consumption in many countries. Slower population growth combined with more responsible patterns of consumption and production would ease pressure on ecosystems, reduce emissions of greenhouse gases and allow the world more time to identify and adopt new technologies that mitigate adverse impacts or facilitate adaptation.**

63. **To accommodate the increasing demand for food as a result of rising incomes and population growth, a sustainable transformation of food and agricultural systems is required at all levels and in all countries. However, there are no one-size-fits-all solutions; policies must take context into account, including the livelihoods of persons currently employed in agriculture and the job opportunities available in and around their current place of residence.**

64. **The global food system is a major contributor to climate change. Dietary changes involving increased consumption of plants and decreased consumption of animal products, especially in high-income countries, are important both for mitigating climate change and for improving population health.**

65. **At the same time, climate change is likely to decrease the stability of food systems, with a potential for simultaneous failures in multiple regions. Resulting threats to food security and nutrition will be greatest among poorer populations and those living closer to the equator.**

66. **Addressing these problems will require the strong engagement of Governments in economy-wide actions to mitigate climate change, especially for countries with high levels of per capita greenhouse gas emissions. Achieving sustainable food systems will also require reducing food losses through better storage facilities and better organization of value chains, particularly in**

⁴⁸ Dilip Ratha and others, "Data release: Remittances to low- and middle-income countries on track to reach \$551 billion in 2019 and \$597 billion by 2021", World Bank, 16 October 2019.

disadvantaged areas, and by reducing food waste at the retail and consumption levels, especially in high-income countries.

67. Efforts to address malnutrition and initiatives to mitigate the food system's negative environmental impacts are often synergistic. A well-designed and well-managed food and nutrition system would improve both population health and environmental sustainability. For example, reducing red meat consumption in high-income countries would reduce greenhouse gas emissions and make room for a modest increase in meat consumption in low-income countries, while also promoting healthier diets in both settings.

68. Governments should consider adopting and strengthening policies, including incentives, regulations and dietary guidelines, to encourage people to adopt healthy diets based on food that can be produced sustainably. Government policies can create market incentives to encourage shifts in production, while also using consumer education and school curricula to affect consumption habits.

69. Governments should integrate nutrition education and assistance into programmes for education, social protection and health care, including for sexual and reproductive health-care services.

70. Government policies to promote healthy diets should focus on “double-duty” actions that can simultaneously reduce risks of both the nutritional deficiencies associated with underweight, wasting and stunting and those responsible for the rising prevalence of overweight and obesity.

71. Policies to make the food system more sustainable may result in higher food prices, which could diminish access to food among poorer populations. Governments should mitigate these negative impacts through policies and programmes to raise incomes among the poor and by providing income supplements where needed.

72. Governments and international organizations should ensure that trade rules for food and agricultural products take into consideration their social and environmental impacts and should prevent unfair competition against those countries that adopt more stringent environmental and social regulations.

73. Innovative agricultural technologies, such as precision agriculture, agroecology, organic and conservation agriculture, and integrated pest management, will require significant investment in research, development and human capital to adapt them to local contexts and make them affordable to all producers. Governments can create market incentives and regulatory frameworks to boost research and build human capital.

74. Governments and the international community should support investment in seed systems for fruits and vegetables, not only for staple crops. The future development of food systems should make greater use of plant diversity and increase the production of underutilized plant-based foods.

75. Governments and the international community are urged to support research and data collection to improve monitoring of the nutritional status of all population groups, including for micronutrient deficiencies. Research is also needed to identify best practices for improving nutrition, including interventions to halt the rising prevalence of obesity.