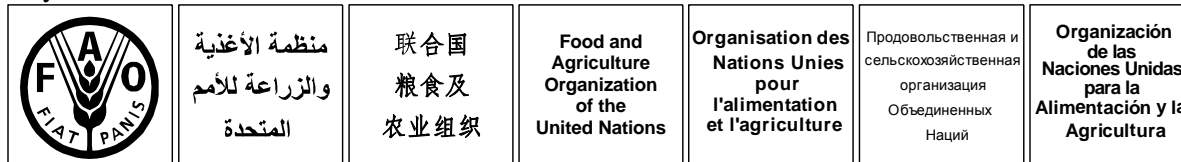


May 2013



## CONFERENCE

### Thirty-eighth Session

Rome, 15-22 June 2013

### The State of Food and Agriculture: Sustainable Food Systems for Food Security and Nutrition

#### Executive Summary

FAO's latest estimates indicate that the proportion of the world's population suffering from undernourishment is around 12.5 percent, down from almost half of the world's population in 1947. This is a remarkable achievement, yet 868 million people remain hungry, an estimated 2 billion people suffer from one or more micronutrient deficiencies and an estimated 1.4 billion people are overweight, of whom 500 million people are obese. Agriculture makes fundamental contributions to human nutrition through production, prices and incomes, but agriculture and the broader food system including post-harvest processing, distribution and retailing, can contribute much more. Food systems as a whole, from production through consumption, can be made more nutrition-enhancing and more environmentally sustainable through a number of specific actions that are identified in the report.

#### Suggested action by the Conference

The Conference:

- Notes the persistence of undernourishment, undernutrition and micronutrient deficiencies and the emergence of overweight and obesity in many parts of the world. Multiple forms of malnutrition can coexist within the same country, household and individual.
- Recognizes the potential of food systems to become both more sustainable and more supportive of good nutritional outcomes and the need for a multi-sectoral approach that includes agriculture and food systems, health, sanitation, social protection, employment and education.
- Requests all relevant stakeholders to make a concerted effort to close the gaps that remain regarding basic data on diets and on nutritional status; conduct impact evaluation of agricultural food-based interventions on nutritional outcomes; encourage management practices and technologies to improve sustainability and nutrition; evaluate the impacts of markets, trade and market structure on environmental sustainability and human nutrition; and recognize the roles of consumer choice in achieving nutritional and sustainability objectives.

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## I. Introduction

1. The first edition of *The State of Food and Agriculture*, published in 1947, reported that about half of the world's population was chronically malnourished. Malnutrition was considered at that time primarily in terms of inadequate energy consumption due to food shortages and poverty. Since then, our understanding of malnutrition<sup>1</sup> and its causes has become more sophisticated, and the role of food systems<sup>2</sup> in facilitating -- or undermining -- better nutrition has become much more complex. Making food more available, accessible, safe, diverse and nutritious remains a major challenge, especially with the expected increase in demand for food over the decades to come, but the ways we produce and use food need to become more environmentally sustainable and nutrition-enhancing if food insecurity and malnutrition in all its forms are to be eradicated.

## II. Malnutrition in the world

2. People in the world are living longer and healthier than at any time before due to a number of factors including improvements in water and sanitation, health services and increased availability of and access to food. Indeed, FAO's latest estimates indicate that the proportion of the world's population suffering from lack of sufficient caloric intake has declined to 12.5 percent from almost half in 1947 (FAO 1947).<sup>3</sup> This is a remarkable achievement, yet 868 million people remain hungry. In addition an estimated 2 billion people suffer from one or more micronutrient deficiencies (FAO 2012)<sup>4</sup> and an estimated 1.4 billion people are overweight, of whom 500 million people are obese (WHO 2013a).<sup>5</sup>

3. Stunting (low height-for-age) in children under 5 years of age is a widely used indicator of undernutrition because it captures the effects of chronic long-term nutritional deprivation and disease and is a powerful predictor of the life-long burden of undernutrition. Between 1990 and 2011, the prevalence of stunting declined by an estimated 16.6 percentage points, from 44.6 percent (284 million) to 28 percent (160 million) in developing countries (Figure 1). This is clearly progress but the remaining high numbers illustrate the challenge in eliminating hunger and malnutrition altogether.

4. Three of the most commonly measured micronutrient deficiencies and related disorders refer to vitamin A, anaemia (related to iron), and iodine (Figure 1). Deficiency in vitamin A impairs normal functioning of the visual system, and maintenance of cell function for growth, red blood cell production, immunity and reproduction and is the leading cause of blindness in children; in 2007,

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<sup>1</sup> Malnutrition is an abnormal physiological condition caused by inadequate, excessive, or unbalanced intake in macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins and minerals) necessary for an active, healthy life. The condition includes deficiencies in adequate nutrition, specific deficiencies (or excesses) in micronutrients, and an excess of certain food components such as fats and sugars, often in combination with low physical activity (leading to overweight and obesity, or overnutrition) (FAO. 2011. Evaluation of FAO's Role and Work in Nutrition. Final Report. PC 108/6. Rome: FAO). Parasites and disease that affect the absorption of nutrients can contribute to malnutrition.

<sup>2</sup> Food systems encompass the entire range of activities involved in the production, processing, marketing, consumption and disposal of goods that originate from agriculture, forestry or fisheries, including the inputs needed and the outputs generated at each of these steps. Food systems also involve the people and institutions that initiate or inhibit change in the system as well as the socio-political, economic and technological environment in which these activities take place. Adapted from FAO. 2012. Sustainability Assessment of Food and Agriculture Systems (SAFA) 2012. Rome: FAO.

[http://www.fao.org/fileadmin/user\\_upload/sustainability/SAFA/SAFA\\_Guidelines\\_draft\\_Jan\\_2012.pdf](http://www.fao.org/fileadmin/user_upload/sustainability/SAFA/SAFA_Guidelines_draft_Jan_2012.pdf).

<sup>3</sup> FAO. 1947. The State of Food and Agriculture. The Food and Agriculture Organization, Rome. (available at <http://www.fao.org/docrep/016/ap635e/ap635e.pdf>)

<sup>4</sup> FAO, IFAD & WFP. 2012. The State of Food Insecurity in the World: Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. The Food and Agriculture Organization of the United Nations, Rome.

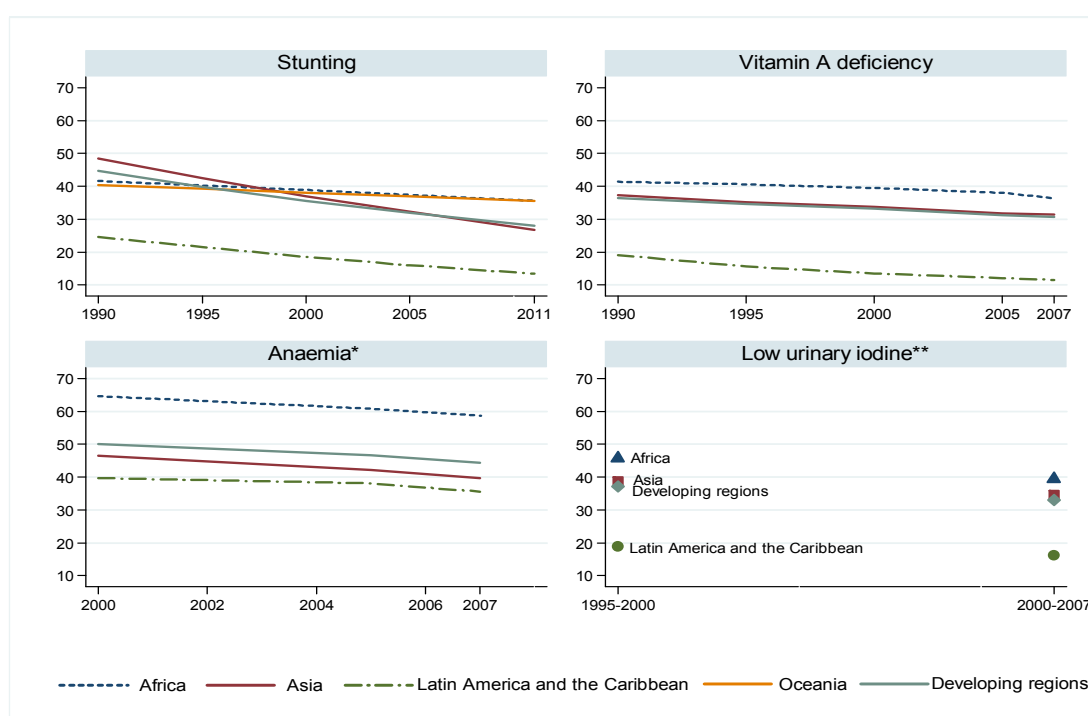
<sup>5</sup> WHO. 2013a. Fact Sheet No. 311. <http://www.who.int/mediacentre/factsheets/fs311/en/>.

163 million children under five in developing regions were estimated to be vitamin A deficient, with a prevalence of about 31 percent, down from approximately 36 percent in 1990 (SCN 2010).<sup>6</sup>

5. Iron deficiency is a major cause of anaemia. Iron-deficiency anaemia negatively affects the cognitive development of children, pregnancy outcomes, maternal mortality and work capacity for adults. Estimates indicate a modest fall in the prevalence of anaemia in children under 5, from 50 percent in 2000 to 44 percent in 2007 (SCN 2010).

6. Iodine deficiencies impair mental function in 18 million children born each year. Estimates indicate that goiter prevalence (indicative of an extended period of deprivation, assessed in adults and/or children) in developing regions fell from about 16 to 13 percent between 1995-2000 and 2001-2007 (regional averages are only shown for these two time periods due to data limitations). Low urinary iodine (indicative of a current iodine deficiency) fell from about 37 to 33 percent (SCN 2010).

**Figure 1. Prevalence of child stunting and micronutrient deficiencies among children, by developing regions**



Note: \* Anaemia is caused by several conditions including iron deficiency. \*\* Low urinary iodine was measured for the entire population, not just children.

Source: Authors' compilation using data from UNICEF, WHO and World Bank, 2012, and data on vitamin A deficiency, anaemia and low urinary iodine from UNSCN 2010.<sup>7</sup>

7. Overweight and obesity, defined as Body Mass Index<sup>8</sup> greater or equal to 25 and 30, respectively, is recognized as increasing the likelihood of incurring various non-communicable diseases and health problems, including cardiovascular disease, diabetes, various cancers and

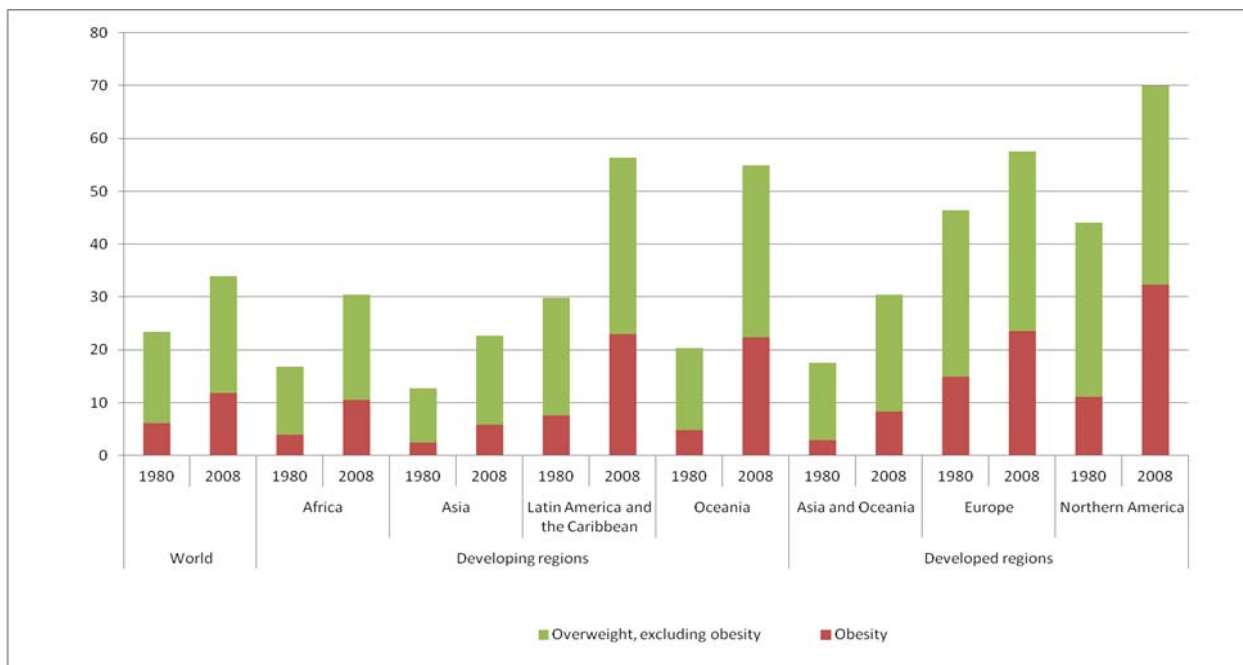
<sup>6</sup> UNSCN. 2010. Sixth report on the world nutrition situation: Progress in nutrition. United Nations System Standing Committee on Nutrition, Geneva.

<sup>7</sup> United Nations Children's Fund, World Health Organization, The World Bank. 2012. UNICEF-WHO-World Bank Joint Child Malnutrition Estimates. UNICEF, New York; WHO, Geneva; The World Bank, Washington, D.C.

<sup>8</sup> The BMI equals the body weight in kilograms divided by height in meters squared and is commonly measured in adults to assess underweight, overweight and obesity. The international references are as follows: underweight = BMI < 18.5; overweight = BMI ≥ 25; obese = BMI ≥ 30. Obesity is thus a subset of the overweight category.

osteoarthritis (WHO 2011).<sup>9</sup> The global prevalence of combined overweight and obesity has risen in all regions, with prevalence among adults increasing from 25 to 34 percent between 1980 and 2008. The prevalence of obesity has increased even faster, doubling from 6 to 12 percent (Figure 3).

**Figure 2 The prevalence of overweight and obesity among adults, by region**



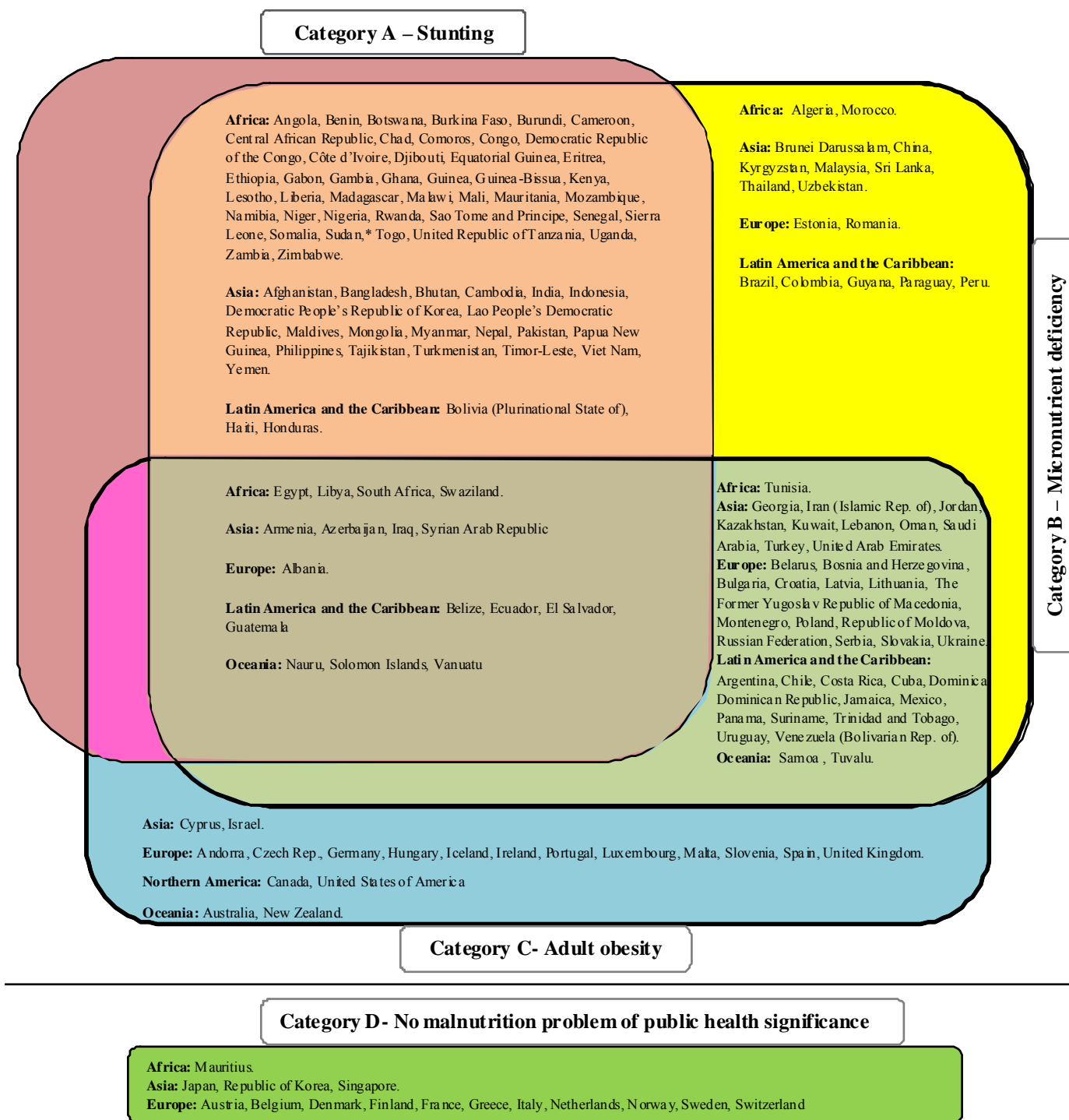
Source: Authors’ calculations using data presented in Finucane et al. 2011. National, regional and global trends in body-mass index since 1980: Systematic analysis of health examination surveys and epidemiological studies with 960 country years and 9.1 million participants. *The Lancet*, published online, February 4, DOI: 10.1016/S0140-6736(10)62037-5, and Stevens et al. 2012. National, regional, and global trends in adult overweight and obesity prevalences. *Population Health Metrics* Vol. 10:22.

8. Because a single individual may suffer from more than one type of malnutrition, these categories cannot be added together to provide a global estimate of the prevalence of malnutrition, yet clearly the profile of malnutrition has changed dramatically since 1947. The persistence of undernourishment in many countries, the recognition of micronutrient deficiencies as a form of “hidden hunger”, and the emergence of overweight and obesity as a global concern lend ever greater urgency and complexity to the malnutrition challenge.

9. Figure 3 shows how the burdens of malnutrition can overlap. The types of malnutrition considered here (designated as: A = child stunting, B = child micronutrient deficiencies, and C= adult obesity) occur in different combinations around the world. Figure 3 also shows the very few countries in the world that have no significant malnutrition problems in these categories.

<sup>9</sup> WHO. 2011. Global status report on noncommunicable diseases. WHO, Geneva.

Figure 3 The multiple burdens of malnutrition



Malnutrition category:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #f4a460; border: 1px solid black; margin-right: 5px;"></span> Stunting and micronutrient deficiencies (AB)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #c8a280; border: 1px solid black; margin-right: 5px;"></span> Stunting, micronutrient deficiencies and obesity (ABC)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #ffff00; border: 1px solid black; margin-right: 5px;"></span> Micronutrient deficiencies (B)</li> </ul> | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #c8e6c9; border: 1px solid black; margin-right: 5px;"></span> Micronutrient deficiencies and obesity (BC)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #bbdefb; border: 1px solid black; margin-right: 5px;"></span> Obesity (C)</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #c8e6c9; border: 1px solid black; margin-right: 5px;"></span> No malnutrition problem (D)</li> </ul> |
|---|--|

Note: Data for stunting among children are from UNICEF, WHO and World Bank (2012) (see footnote 7). A country is designated as having a public health threat related to stunting if at least 20 percent of its children are stunted (WHO, 2013b); data on stunting are not available for some high-income countries and they are assumed to have a prevalence of stunting that is far lower than 20 percent. Data on anaemia and vitamin A deficiency among children are from Micronutrient Initiative (2009). Countries face micronutrient deficiency related public health threats if 10 or more percent of their children are deficient in vitamin A (WHO, 2009) or if at least 20 percent of them suffer from anaemia (WHO, 2008). Countries with a per capita GDP of at least US\$ 15,000 are assumed to be free of vitamin A deficiency (Micronutrient Initiative, 2009). Data on obesity among adults are from WHO (2013c). Countries where 20 or more percent of the adult population is obese (equivalent to the global median prevalence for that indicator) are considered to face a public health threat related to obesity.<sup>10</sup>

\*Data for Sudan was collected prior to 2011 and refer therefore to Sudan and South Sudan.

10. The changing profile of malnutrition is reflected in a global shift from early death due to communicable diseases to longer lives and later death from chronic non-communicable diseases (NCDs), and is primarily a story of technological, social, and economic success.<sup>11</sup> However, it is an incomplete success for many countries who have not yet seen advances in sanitation and water quality, where rural and child hunger remain common and where advances in health care systems are yet to diminish the adverse health effects of over-nutrition. Indeed, diet-related NCDs are emerging increasingly among lower- and middle-income groups in less affluent countries. The economic costs of NCDs under-nutrition and micronutrient deficiencies on health care systems and lost economic production are substantial.

11. For all individuals to be food secure and well-nourished, the food system must provide foods that are available, accessible, safe, diverse, and nutritious, and people must make healthy choices. The contribution agriculture makes to nutritional outcomes through production, prices and incomes is fundamental, but the broader food system including post-harvest processing technologies, distribution and marketing, can contribute much more. Food systems as a whole, from production through consumption, can be made more nutrition-enhancing and more environmentally sustainable through a number of specific actions.

### III. Why is nutrition important?

12. Good nutrition is the foundation for human health and well-being, physical and cognitive development, and economic productivity. Nutritional status is a critical outcome indicator of overall human and economic development, as well as an essential social benefit in its own right. Nutritional status is also an input to social and economic development, and good nutrition is the key to breaking intergenerational cycles of poverty, because good maternal nutrition produces healthier children, who grow into healthier adults.

13. Maternal and child undernutrition is the primary pathway through which poverty is transmitted from one generation to the next. The critical window for adequate child growth and cognitive development is between conception and 24 months of age. Developmental damage that results from undernutrition during this period cannot be reversed or regained over time. For this reason, many national and international nutrition initiatives now focus on the first 1000 days.

14. The most immediate causes of undernutrition and micronutrient deficiencies are inadequate dietary intake and infectious disease. Inadequate dietary intake weakens the immune system and

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<sup>10</sup> WHO. 2013b. Global Database on Child Growth and Malnutrition.

<http://who.int/nutgrowthdb/about/introduction/en/index5.html> ; Micronutrient Initiative. 2009. Investing in the Future: A United Call to Action on Vitamin and Mineral Deficiencies - Global Report 2009. MI, Ottawa, Canada; WHO. 2009. Global prevalence of vitamin A deficiency in population at risk 1995-2005. WHO Global Database on Vitamin A Deficiency; WHO. 2008. Worldwide prevalence of anaemia 1993-2005. WHO Global database on anaemia. World Health Organization, Geneva; WHO. 2013c. Global Health Observatory Data Repository on Obesity.

<sup>11</sup> Chicago Council, Bringing Agriculture to the Table: How Agriculture and Food can Play a Role in Preventing Chronic Disease. Chicago, 2011

increases susceptibility to disease, and infectious disease, in turn, reduces appetite, increases nutrient requirements and further weakens the immune system. There are three underlying causes of this vicious cycle: (i) lack of availability or access to adequate food, (ii) infections mediated through inadequate water, sanitation and health services, and (iii) for infants and young children, poor maternal and child caring practices, including inadequate breastfeeding and lack of nutritious complementary feeding; and for adults, poor food choices.

15. Overweight and obesity is associated with absenteeism, lower labour productivity and higher medical costs due to associated non-communicable chronic diseases, such as diabetes and heart disease (WHO 2011). A recent study estimates a cumulative output loss due to non-communicable diseases, for which overweight and obesity is a key risk factor, of US\$47 trillion over the next two decades (Bloom et al. 2011); equivalent to about US\$ 1.4 trillion in 2010, assuming a 5 percent rate of inflation.

16. The most immediate cause of overweight and obesity is overconsumption of energy relative to physical requirements. The rapid increase in the prevalence of overweight and obesity in recent decades has given rise to many explanations, including changes in the food system since the mid-20<sup>th</sup> century which have resulted in lower real prices of food, changes in relative prices of different types of food and increased availability of convenient, highly processed, energy-dense, micronutrient-poor foods.

#### **IV. Changes and challenges in food systems of today**

17. Analyses and actions to shape food systems for better nutrition must take into account the fact that there is no single food system but rather a multiplicity of systems with characteristics that vary, for example, with incomes, livelihoods and urbanization. Even these systems are in a process of constant change. Trends in economies and societies, from local to global level, are changing the ways that people produce, process and acquire food.

18. Economic and social development lead to the gradual transformation of agriculture, characterized by rising labour productivity, declining shares of population working in agriculture and rising urbanization. New modes of transportation, leisure, employment and work within the home cause people to lead more sedentary lifestyles and to demand more convenient foods. Through their research and marketing efforts, food companies are shaping as well as responding to these demands. As the food system transforms, centralized food processing facilities develop along with large-scale wholesale and logistics companies, supermarkets emerge in the retail sector and fast-food restaurants and street-food vendors become widespread. The transformation thus affects the whole system, changing the way food is produced, harvested, stored, traded, processed, distributed, sold and consumed.

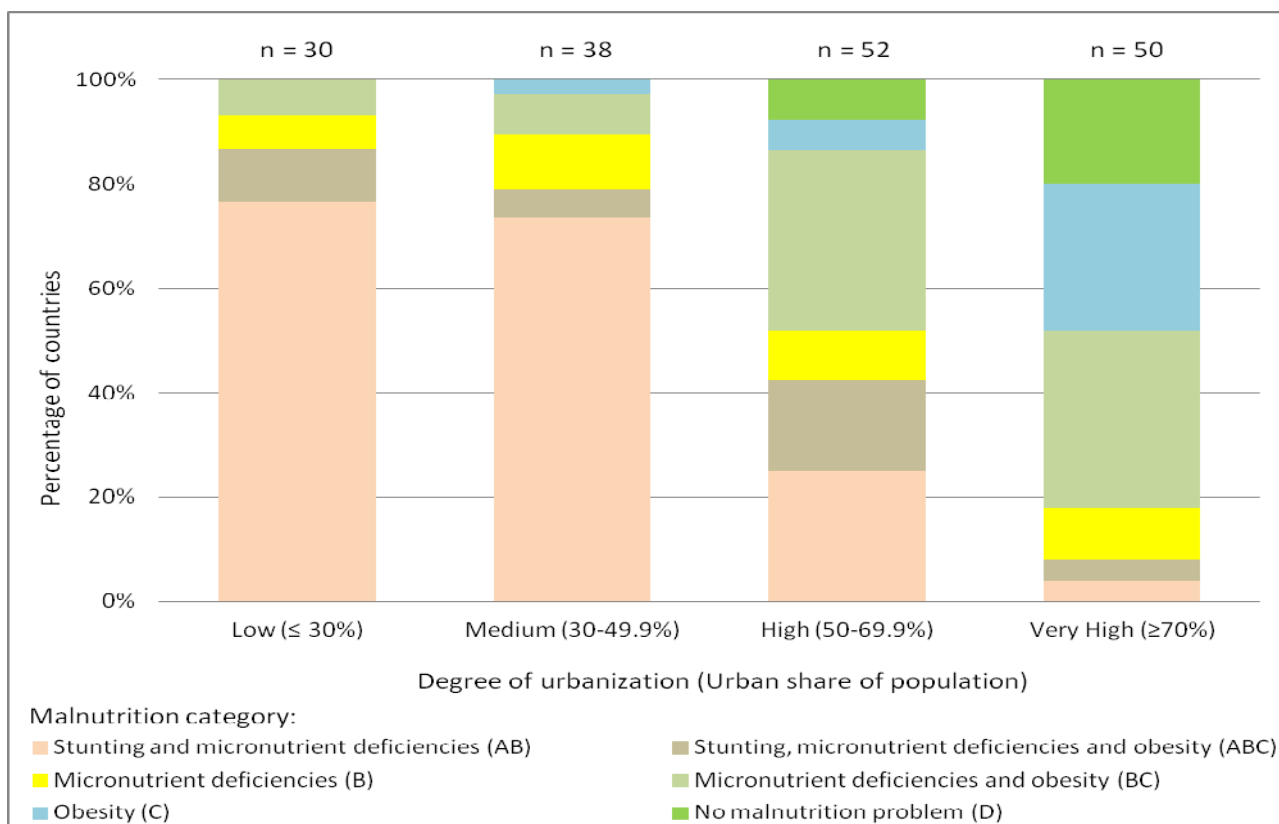
19. Trade, urbanization and new technologies also provide economies of scale for markets, resulting in lower transport costs both domestically and world-wide. Combined with rising incomes, these changes widen the diversity of products available. This diversity leads to higher consumption of animal-source foods and fruits and vegetables, a positive development for those who are food insecure, but also to higher consumption of processed foods which contain more fats, sugars, and salt. Combined with lower energy expenditures, these dietary changes have consequences for increased risk of overweight and obesity, particularly in urban populations. These changes in prices, incomes, purchasing and consumption patterns are also occurring in rural areas, where packaged goods are marketed through traditional retailers.

20. These changes in activity and dietary patterns in developing countries are part of a “nutrition transition” where countries simultaneously face not only the emerging challenge of rising levels of overweight and obesity and related non-communicable diseases but continue to deal with the problems of undernutrition and micronutrient deficiencies (Figure 4). This transition corresponds closely to rises in income, urbanization, and the structural transformation of the food system, as seen primarily in



industrialized and middle-income countries. Popkin, Adair and Ng (2012) describe this as “the primary mismatch between human biology and modern society”<sup>12</sup>.

**Figure 4 Proportion of countries in each malnutrition category by level of urbanization (N=number of countries in each category)**



Notes: n is the number of countries characterized by each degree of urbanization. The degree of urbanization is the share of the urban population in the total population. Malnutrition categories are those illustrated in Figure 3.

Sources: Authors' calculations, using data for total and urban population from FAOSTAT. Sources used to determined malnutrition categories are those used for Figure 3.

## V. Food systems and nutrition opportunities

21. Considering the entire food system in addressing nutrition provides a frame for action in which to determine, design and implement food-based interventions to improve diets and raise levels of nutrition. The multiple links between food systems and nutrition offer many opportunities to shape systems so they can promote better nutrition. Figure 5 provides a schematic overview of the elements of food systems, and the broader economic, social, cultural and physical environment within which they operate. It highlights opportunities for improving the nutritional outcomes and identifies some policy tools that may be appropriate.

22. The first column details the elements of a food system, in three broad categories (i) agricultural production up to the farm gate, including R&D, input supply, and production and management decisions; (ii) from the farm gate to the retailer, including processing, storage, transport and retailing and (iii) consumers.

23. The second column lists some examples of potential interventions that are targeted specifically at improving nutrition – “opportunities,” that is, to shape the system. The third column notes some

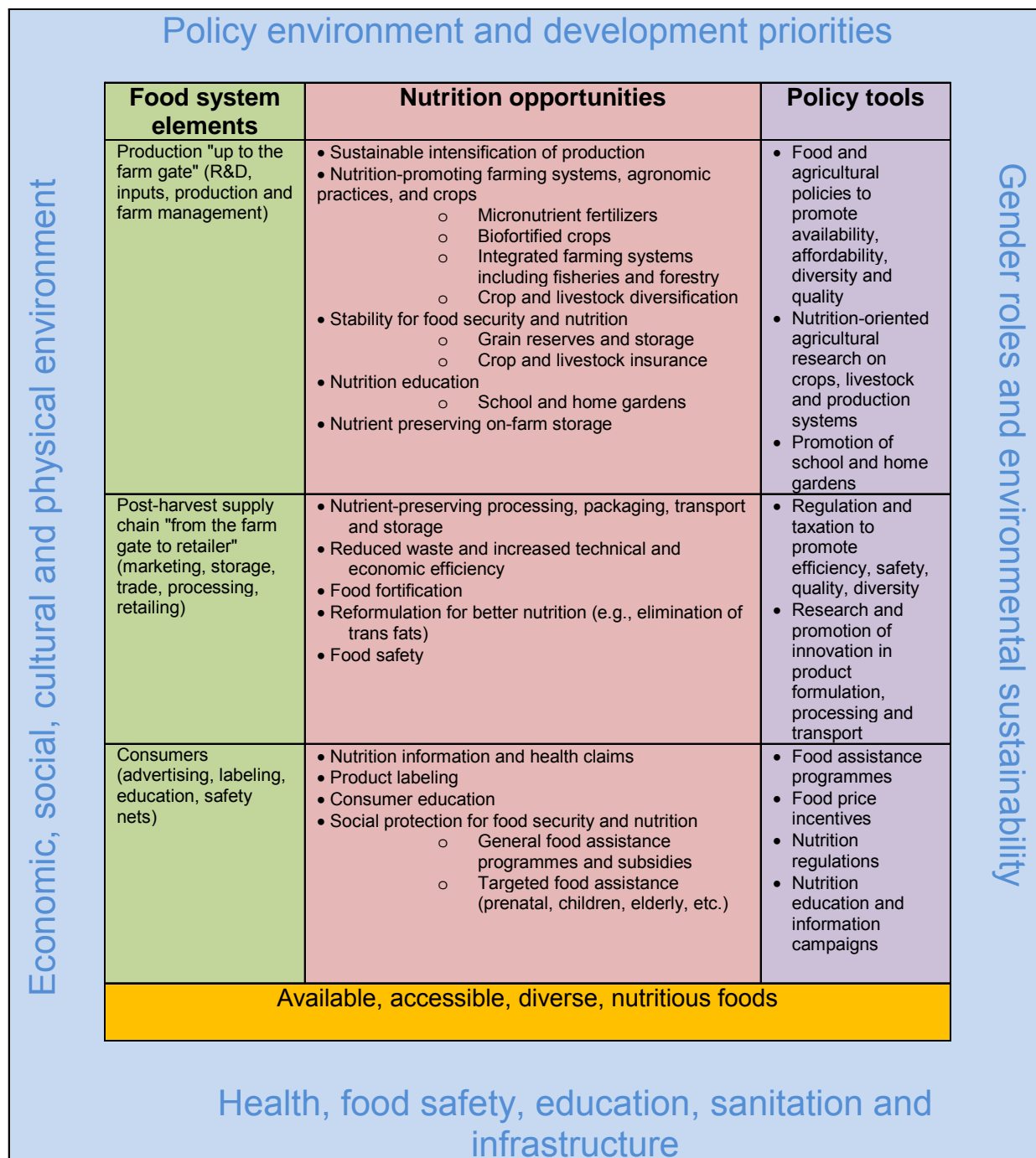
<sup>12</sup> Popkin, B.M., L.S. Adair, and S.W. Ng. 2012. Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Review*, Vol. 70(1): 3-21.

potential policy tools related primarily to food, agriculture, and rural development that can influence the system. The outer ring illustrates the broader context which may also be made more “nutrition enhancing”, for example, by giving higher priority to nutrition within national development strategies and considering the nutrition implications of broader macroeconomic policies, the status of women and environmental sustainability.

24. Food-based approaches to nutrition are often contrasted with those that rely on medically based interventions such as vitamin and mineral supplements. Although food supplements can address specific dietary deficiencies when they exist, a nutritious diet (consumption of food that is adequate in quantity in terms of calories as well as in quality in terms of variety, diversity, nutrient content and safety) ensures that an individual gets not only the specific macro- or micronutrients present in the supplement but the whole complex of energy, nutrients and fibre required, perhaps interacting in ways that are important for good nutrition and health but that are not yet fully understood.

25. A food-based approach further recognizes the multiple benefits (nutritional, physiological, social, cultural and mental) that come from enjoying a variety of foods. Creating a strong nutrition-enhancing food and agricultural system is arguably the most practical, convenient, and sustainable way to address malnutrition, as food choices and consumption patterns ultimately become integrated into the lifestyle of the individual.

**Figure 5: Food system interventions for better nutrition**



### **A. Agricultural Production for better nutrition**

26. Nutrition interventions in agriculture generally focus on increasing the abundance, diversity and affordability of food. The most fundamental intervention to enhance the productivity of the agricultural sector is through research and development (R&D) and agricultural policies and services. The available evidence shows that agricultural growth is effective in sustainably reducing malnutrition in low-income countries where many people depend on agriculture, but it is slow and may not be sufficient. Therefore, additional complementary ways of reducing malnutrition are necessary.

27. Increases in agricultural productivity and gains in food security can also be driven by agricultural support and protection policies. Yet agricultural policies in many countries are quite complex and may influence nutrition in contradictory ways. And agricultural policies affect both more nutritious and less nutritious foods and hence the overall impact on healthiness of diets may be positive or negative. With rising incomes and increased affordability of a range of foods, factors such as convenience and responsiveness to nutrition education may be key variables in determining the effects of agricultural policies on nutrition.

28. Efforts to boost agricultural productivity must also consider the impacts on time use - especially of women, who bear a greater responsibility for food preparation and child care (FAO, 2011). Maternal and child nutrition are particularly vulnerable to the seasonal time demands placed on female agricultural workers. Disruptions to adequate maternal nutrition and good care and feeding practices during the critical 1000 days from conception through the first two years of life can cause lasting damage to women's health and life-long physical and cognitive impairment in children. Understanding the nutritional consequences of the time constraints on rural women, investing in infrastructure and technology to alleviate these burdens and making specific nutrition-related interventions during critical periods in the agricultural calendar can help improve nutritional outcomes for women and children.

29. In developing countries many governments have subsidized inputs, mainly fertilizer and seeds, with a view to boost production and food security. The impact of these subsidies has not been well studied, but evidence from Malawi and India indicates that they can significantly boost agricultural production and farmers' incomes (HLPE 2012).

30. Poor households' diets are often monotonous, typically relying on a single carbohydrate-rich starchy staple to provide the bulk of energy consumed. Interventions that increase dietary diversity may also help address micronutrient deficiencies. Few countries have made diversification a specific policy objective and much more could be done. As an example, there is little R&D focused on raising the productivity and availability of nutrient-dense foods such as animal source foods, legumes, and certain vegetables and fruits.

31. Programmes that support the diversification of home and smallholder production hold potential for improving consumption of a variety of foods and reducing micronutrient deficiencies. Such programmes range from very small scale home gardens to more complex integrated farming projects that include livestock and aquaculture and income generating activities. Existing evidence, although scarce, indicates that such interventions are more effective in raising intakes of micronutrient-rich food when they have clear nutrition objectives and integrate nutrition education, and gender considerations.

32. Other interventions, such as micronutrient fertilizer and biofortification, address micronutrient deficiencies by raising the micronutrient content of common staples. The CGIAR's HarvestPlus programme carries out extensive research and development on biofortification, relying on conventional plant breeding. The most promising results so far have been achieved with Orange Flesh Sweet Potato but other biofortified commodities are being developed.

### **B. Nutrition in food supply chains**

33. Agricultural products reach consumers through food supply chains. Each link in a food supply chain affects the availability, affordability, diversity and nutritional quality of foods. Increasing efficiency, reducing losses and waste, both of food and of the nutrients the food contains, and

improving nutritional content through fortification are key interventions that influences availability, affordability and diversity of food and in turn shapes consumer choices, dietary patterns and nutritional outcomes.

34. Increasing efficiency of food supply chains is in part the result of the modernization led by large food processors, distributors and retailers which are expanding rapidly in many developing countries. This process is often driven by greater vertical integration achieved through vertical coordination of primary producers, input suppliers, and processors. These increases in efficiency create the potential for farmers to receive higher prices for their produce and for consumers to pay lower prices for food, but this requires appropriate regulatory policies to ensure a competitive food processing and retail sector.

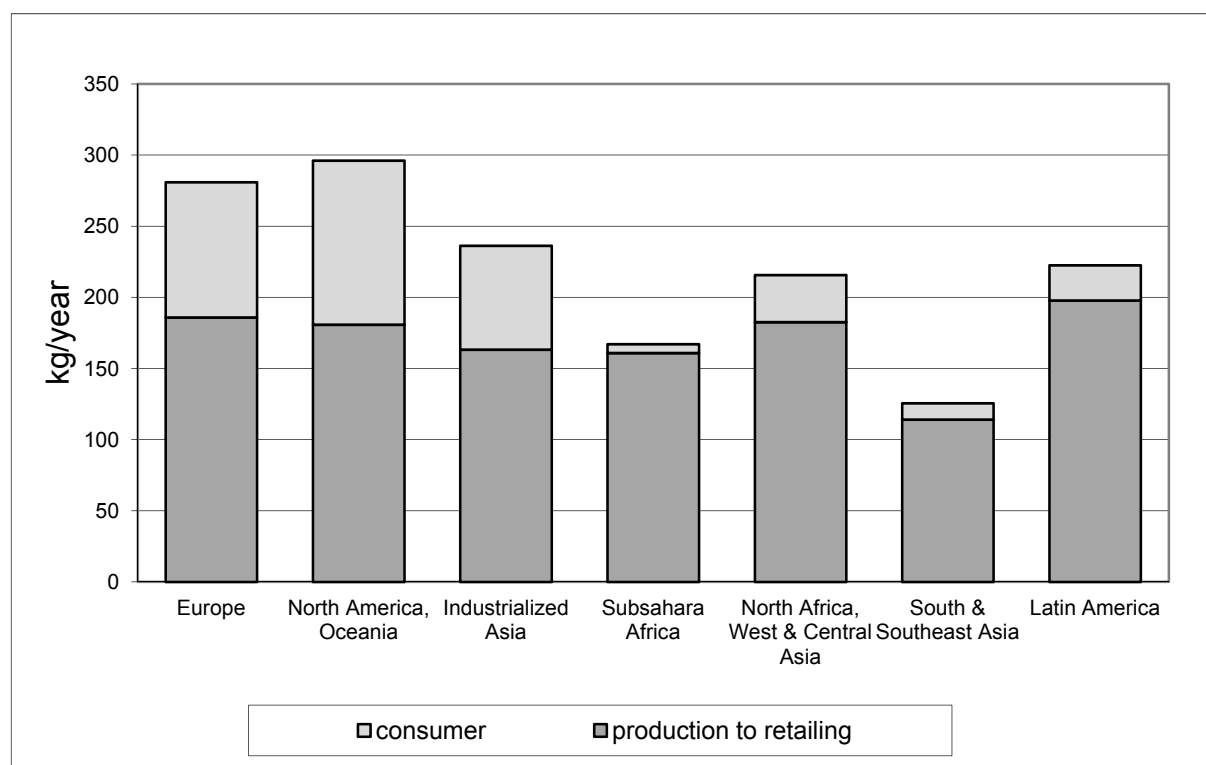
35. Integrating smallholders into domestic food value chains remains a major challenge. Poor performance in other aspects of the value chain, such as storage, transport and distribution, can impede smallholder market participation. Investments in public goods that support the development of transport, communication and service infrastructure can substantially reduce producer risk, improve value chain performance, and so raise smallholder income.

36. Interventions to reduce losses and waste along the chain from farm to consumer also offer very significant opportunities to raise availability and affordability of food. A recent FAO report estimates that roughly one-third of food produced globally for human consumption is lost or wasted (Gustavsson et al. 2011).<sup>13</sup> Food waste reduces the sustainability of food systems, as more production is required to feed the same number of people, which wastes seeds, fertilizer, irrigation water, labour, fossil fuels, and other agricultural inputs.

37. In developing regions most losses occur at the farm level and along the supply chain, before arriving at the consumer (Figure 6). Only 5-15 percent of food losses occur at the consumer level in developing regions compared with 30-40 percent in developed regions. Losses of some micronutrient-rich perishable foods such as fruit and vegetables and fish are typically greater than losses of cereals.

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<sup>13</sup> Gustavsson J., C. Cederberg, U. Sonesson, R. van Otterdijk, and A. Meybeck. 2011. Global food losses and food waste: Extent, causes and prevention. Food and Agriculture Organization of the United Nations. Rome.

**Figure 6 Per-capita food losses and waste, by region**

Source: Gustavsson et al (2011).

38. Many interventions to effectively reduce post-harvest losses are known (e.g., small-scale post-harvest storage facilities, improved pre-harvest management, and/or increased food processing opportunities), but little is known about the impacts of such initiatives on nutrition.

39. Finally, food processing offers the opportunity to modify the nutritional content of foods, for example through fortification with specific key micronutrients, such as vitamin A, vitamin D, iron and zinc. Such techniques can be an effective and economically efficient means of treating nutrition-related disorders. However, high start-up costs and the need for technical know-how suggests that fortification programmes can benefit from public-private partnerships. For poor consumers on the margins of the economy outside the coverage of fortified foods, traditional supply chains such as corner stores, wet markets and other small retail outlets are likely to be the most effective channel.

### C. Helping consumers achieve better nutrition

40. Interventions in the food systems can help consumers make better choices. Key interventions focus on behaviour change through a variety of instruments, including nutrition education, public information campaigns, nutrition labelling, taxation, subsidies and food assistance programmes.

41. Efforts to influence consumer behaviour often focus on increasing a person's knowledge about the issue. Information measures to promote good nutrition include: nutrition education in schools and other institutions; public information campaigns including dietary guidelines; regulation of advertising and labelling.

42. Formal schooling has a positive effect on mothers and children's long-term health and nutritional status. But nutrition education can have a separate positive impact in the short-term. For example, households with nutrition knowledge have been observed to protect their consumption of

micronutrient-rich foods in periods of negative price shocks, while those households without nutrition knowledge did not.

43. Standardized nutrition labels are another source of information for consumers, aimed at helping them make more nutritious food choices. When used, nutrient labels may influence consumer decisions but their effectiveness depends on consumers being able to read and understand and have the resources to act.

44. Also, mandatory disclosure of information about the nutritional content of food can influence the behaviour of food processors and retailers as well as that of consumers, even encouraging the reformulation of products. For example, the mandatory inclusion of trans fats on nutrition labels in the United States led major brands to rapidly substitute away from trans fats.

45. In general advertising and nutrient labelling, as well as nutrition education and public information campaigns, are more likely to be effective when other parts of the food system are equally supportive. For example, experience has shown that nutrition education is best combined with other actions, such as women's empowerment, better access to health services, and the accompanying provision of complementary foods, so as to promote effective behavioural change.

46. The realization that malnutrition imposes costs on society beyond those directly reflected in food prices justifies government action to shape consumption patterns and diets. Significant knowledge gaps exist with regard to how government policies can promote healthier diets.

47. For the many consumers that face temporary or chronic food insecurity, food-based assistance programmes, often part of broader social protection programmes, may help avert famine and build resilience to shocks. Food assistance programmes are more effective when the nutritional objective is clearly specified and the programme's content shaped to achieve it. And better targeting to vulnerable populations may be the best way to improve effectiveness and efficiency of transfers aimed at increasing food consumption. Prenatal and early childhood programmes are widely regarded as among the most effective food-based programmes available.

## **VI. Cross-cutting issues in nutrition-sensitive food systems**

48. Although many interventions are specific to a particular part of the food system, there are some issues that nearly all interventions need to address. For example, gender issues are always relevant because men and women, who participate in every part of the food system, have different roles and therefore will be affected differently by any interventions aimed at making food systems more nutrition enhancing. Similarly, concerns related to environmental sustainability touch every aspect of the food system and have fundamental implications for nutrition.

### **A. Gender roles for better nutritional outcomes**

49. Men and women typically play differentiated roles in food systems and within the household, although these differences vary widely by region and are changing rapidly (FAO 2011).<sup>14</sup> Gender-sensitive interventions can improve nutritional outcomes by recognizing women's role in nutrition (from agricultural production, food provision, and care) and as efficient managers of limited household resources by promoting gender equality throughout the system. In agriculture, technologies that enhance the labour-productivity of rural women, such as better farm tools, water provision, modern energy services, and household food preparation, can free their time for more important activities.

50. Raising women's incomes has important implications for nutrition outcomes, because women still play a central role in shaping household food consumption patterns. Women who earn more income have stronger bargaining power within the household. This enables women to exert more

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<sup>14</sup> FAO. 2011. The State of Food and Agriculture 2010-11: Women in Agriculture: Closing the gender gap for development. The Food and Agriculture Organization of the United Nations, Rome.

influence over decisions regarding consumption, investment and production, which results in better nutrition, health and education outcomes for children (World Bank, 2011)<sup>15</sup>.

## **B. Sustainable food systems**

51. The important role of agriculture in managing natural resources and the environment for the health of the ecosystem is well established. Most of the focus has been on the production side where the emphasis is on sustainable intensification that can close yield and productivity gaps in underperforming systems (FAO 2011)<sup>16</sup>. This continues to be of great importance, especially for poor farmers. Yet improving the sustainability of food systems is important for all people. The debate on how to promote more sustainable consumption patterns is highly contentious. There is broad agreement on some issues, such as the need for consumers in developed regions to moderate consumption of animal products and to reduce food waste and losses in all regions, but little agreement on many other issues (UNEP 2012).<sup>17</sup>

52. Environmentally, socially and economically sustainable agricultural production and consumption are important for the well-being of current and future generations. Reductions in food losses and waste throughout the system can help to maintain or improve consumption levels, while at the same time alleviating pressures on production systems. The costs and benefits of a sustainable system must be reflected in decisions made by producers and consumers of food, as well as policy makers (FAO 2012).<sup>18</sup>

## **VII. Knowledge and information gaps**

53. Knowledge regarding many of the issues covered in this document remains incomplete. For example, in many countries there is a lack of basic data and indicators with which to evaluate and monitor the nutrition landscape. Agricultural interventions are difficult to evaluate and many questions remain around the effectiveness of home gardens, the role of gender, agronomic fortification, technological innovations, biodiversity, and the potential of local foods in the nutrition transition. Research on supply chain interventions and their impact on nutrition is scarce, but improved efficiency along the chain, reducing food losses and waste and raising nutritional content of foods are among the least contentious issues in the food system and nutrition debate. The roles of trade, investment, and market structure in nutritional outcomes remain contentious. Knowledge gaps exist also with regard to consumer choice and nutrition outcomes and concepts such as dietary diversity and healthy diets remain fuzzy and difficult to measure objectively. There is need for further research on nutrition education and behaviour change, the link between food system policies and nutrition, and the nexus between the food industry, healthy diets and consumers. Finally, many questions remain of how food systems can contribute to better nutritional outcomes while also adhering to sustainable production and consumption patterns.

## **VIII. Conclusions**

54. Sustainable food systems and the policies and institutions that shape them are fundamental to better nutrition. At the most basic level, food systems determine the quantity and quality of foods available for consumption. Traditionally agriculture has been understood to contribute to nutrition through increasing production and productivity. Increasing overall supply in this way makes food more affordable and available. But agriculture, throughout the food system, can contribute much more.

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<sup>15</sup> World Bank. 2011. World Development Report 2012. Gender Equality and Development. The International Bank for Reconstruction and Development /The World Bank, Washington, D.C.

<sup>16</sup> FAO. 2011. Save and Grow. A policymaker's guide to the sustainable intensification of smallholder crop production. The Food and Agriculture Organization, Rome.

<sup>17</sup> UNEP. 2012. Avoiding Future Famines: Strengthening the Ecological Foundation of Food Security through Sustainable Food Systems. United Nations Environment Programme (UNEP). Nairobi, Kenya.

<sup>18</sup> FAO. 2012. Towards the Future We Want: End hunger and make the transition to sustainable agricultural and food systems. The Food and Agriculture Organization of the United Nations, Rome.



55. By assessing and shaping each element of the food system, policymakers, producers, consumers and other stakeholders can create a food system that improves diets and raises nutrition for all, connecting farm to fork, where food selections are available, affordable, diverse, and nutritious. Helping consumers to make more nutritious food choices as part of a healthy diet can improve nutritional outcomes across the spectrum of malnutrition problems (undernutrition, micronutrient deficiencies and overweight and obesity). Dynamic food systems and the policies and institutions that shape them are central to sustainable solutions to malnutrition.

56. At the same time, good nutrition also contributes to improving food and agriculture. Better nutrition results in more productive labour, improving rural livelihoods and catalyzing economic and social development. Better nutrition also implies increasing food consumption by those who are calorie deficient and reducing calorie intake by those who are simply eating too much to maintain good health. Increasing efficiencies and reducing waste at all levels is an achievable goal which can contribute to making food systems more sustainable. Efforts to improve nutrition through sustainable food systems, then, are a win-win both for society and for agriculture.