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**HIGH LEVEL PANEL OF EXPERTS NOTE ON
CRITICAL AND EMERGING ISSUES
FOR FOOD SECURITY AND NUTRITION**

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High Level Panel of Experts on Food Security and Nutrition

Note on Critical and Emerging Issues for Food Security and Nutrition

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Abstract

Following the request of the Committee on World Food Security (CFS) the High Level Panel of Experts on Food Security and Nutrition (HLPE) has conducted a process to identify a wide range of issues of importance for food security and nutrition, as well as their interrelations, in a systemic way. Within the diversity of issues, the HLPE has identified, in addition to the nine issues that have already been the topic of an HLPE report, the following five critical and emerging issues of particular importance, both in their own right and as drivers of other issues.

1. Healthy nutrition in changing food systems

Worldwide, populations are suffering from deficiencies in dietary energy intake, nutrient deficiencies and obesity, often co-existing in the same country: the so-called “triple burden” of malnutrition. Understanding the causes of this situation is key to any action to improve nutrition. It requires considering recent evolutions of diets and food systems and their drivers: how and why do diets change? What are the links between diets, consumption and consumer habits and food systems? How do changes in food systems affect changes of diets, and therefore health and nutritional outcomes?

2. Livestock systems and food security and nutrition: challenges and opportunities

Growing demand for livestock products is driving major changes in food systems worldwide, with multiple, diverse and context specific consequences. Increased production can offer opportunities for more diversified diets, access to essential proteins and micronutrients. It also creates opportunities for producers, including diversification of activities, with increased incomes. On the other hand, overconsumption can have negative nutritional and health impacts and concentration of production in some areas can lead to significant environmental stress. How can opportunities be maximized and challenges tackled given the diversity of situations and livestock systems?

3. Inequalities and food security and nutrition: the imperative of addressing the needs of disadvantaged and vulnerable populations

Poverty is a major cause of food insecurity and hunger. Inequalities explain why global availability does not translate into global access to food, both because of unequal distribution of income and because the demand of wealthier populations drives food and resource price increases. Inequalities in access to productive resources are a major cause of food insecurity, particularly for the most vulnerable populations, women, the young and ethnic minorities. Moreover, inequalities also undermine good governance, implementation of human rights including the right to food, and efforts to improve food security and nutrition. How do inequalities at different levels affect food and nutrition security and what can be done to improve the situation and mitigate negative effects?

4. The increasing role of financial markets in food security and nutrition

Agriculture is increasingly part of the global economy and international trade, which are increasingly influenced by global financial markets. These financial markets, worldwide, are increasingly influencing land transactions, agricultural production decisions, rural credit provision, risk insurance and commodity pricing, as well as food distribution and retail. The globalization of food systems goes along with direct or indirect links between them and non-agricultural commodities such as energy, or with financial products such as pension funds. Considering the rapid developments of these trends, what are the potential effects of financialization on food and land prices, on investments in agriculture and as a result on food security and nutrition?

5. Pathways to sustainable food systems: the pursuit of human and environmental health for all

The overarching challenge is how to ensure food security and nutrition for an increasing world population, now and in the future, from limited and diversely available resources, given social and economic imbalances, unequal access to resources and distribution of potential for economic growth income and purchasing power. Current concerns include the inefficiency of food systems, symbolized by food losses and waste, the environmental impacts of food systems and their tendency to rely on low-paid, often informal forms of employment, which in turn have negative social effects. How to find pathways to sustainable food systems that deliver food security and nutrition for all, now and in the future?

This note describes these issues and the process that led to their identification. The order of presentation of the issues above does not imply any priority among them.

Introduction: background and approach

The UN Committee on World Food Security (CFS), the foremost international intergovernmental and multistakeholder platform for food security and nutrition, has given to its High Level Panel of Experts on Food Security and Nutrition (HLPE) the mandate to “identify emerging issues, and help members prioritize future actions and attention on key focal areas” (CFS, 2009).

In line with this mandate, in October 2013, the CFS requested the HLPE to produce a note on critical and/or emerging issues in the area of food security and nutrition. This request came in the context of CFS’s own work to select and prioritize its activities for its programme of work.¹

The objective of this note is to provide a brief, yet comprehensive, evidence-based perspective on critical and/or emerging issues in the area of food security and nutrition (FSN), built on the knowledge of a diversity of actors and guided by the knowledge and experience of the HLPE Steering Committee members. It results from a specific, dedicated process² devised by the HLPE to consider the evidence base, identify knowledge gaps and consult relevant institutions and knowledge-holders. Both the process and the outcome were subject to peer reviews.³

Scope

The request of the CFS to identify “critical and/or emerging issues in the area of food security and nutrition” was interpreted by the Steering Committee of the HLPE as a request to identify issues *impacting or presenting threats to* food security and nutrition in one or several of its four dimensions (availability, access, utilization/nutrition and stability) now or in the future. These issues can be either critical, or emerging, or both.

A critical issue is an issue that has a profound influence on one or more of the dimensions of food security, either directly or indirectly, positively or negatively. This influence might be global or might affect one or more particularly vulnerable populations. In this sense, critical issues include trends and drivers of food and nutrition systems, including changes that increase people’s vulnerability to food insecurity and inadequate nutrition (e.g. climate change). The issues can be local or global, short-term or long-term, nascent or persistent. They can be systemic or relevant to one or more critical points in the system. Due to the very nature of food insecurity, issues that have an impact on most vulnerable people and on women are of particular concern. Critical issues can include persistent, long-standing issues with known impact on food security and nutrition. For critical issues, there might be sufficient or even abundant knowledge, but the knowledge base might not be sufficiently “shared” by all actors, and as a result policy responses may be insufficient or inappropriate.

An emerging issue is an issue for which there are concerns that it could become critical in the future. This can be the case, for instance, when its effects on food security and nutrition are not well known, but seem to be increasing, often quickly. It can also be the case for long-standing issues, but for which the direct or indirect impact on food security has only recently started to be appreciated. Emerging issues can include changes on long-standing issues, or new developments, such as new technologies. It can include issues that are subject to quick and accelerating changes: decision-makers may lack evidence of the extent and dynamic of the problem, of its impact on food security and nutrition, and sometimes even regarding the degree of absolute impact (positive or negative). Emerging issues include issues that would need immediate consideration so as to better understand them and consider possible early responses, in order to avoid more complex or otherwise intractable medium- or long-term food security and nutrition problems at a later time.

¹ In the CFS context, a clear distinction needs to be made between (i) issues of relevance to food security and nutrition, which are the object of the present exercise, and (ii) CFS activities, which are discussed and decided upon by the CFS, following its own distinct processes.

² The description of this process, as well as the relevant questionnaire, is described in the Process and Concept Note, 9 January 2014 (available at www.fao.org/cfs/cfs-hlpe).

³ The present document has been developed by the Steering Committee of the HLPE. The HLPE would like to thank warmly the following experts having provided useful comments on the process and/or on an earlier version of this document: Ousmane Badiane, Joachim von Braun, Jonathan Brooks, Jennifer Clapp, Joanne Daly, Shenggen Fan, Charles Godfray, Bernard Hubert, Ruth Meinzen-Dick, Erik Millstone, Richard Mkandawire, Maria Emilia Pacheco, Martin Pineiro, Jules Pretty, Rudy Rabbinge, Maruja Angelica Salas, William Sutherland, MS Swaminathan, Tom Wakeford and Michael Windfuhr. The HLPE alone is responsible for its final contents.

Methodological challenges

The distinction between critical and emerging issues is sometimes difficult to draw, as one issue can appear as “emerging” for some, whereas it is already critical for others. Also, a long-standing critical issue can be affected by important changes and as such be considered as both critical and emerging.

Identifying, from an evidence-based perspective, critical and emerging issues in the area of food security and nutrition comes with specific challenges.

First, there are many disciplines involved in the identification and framing of relevant issues, and there are many different ways to relate issues to the four dimensions of food security. Issues vary by discipline, from environmental or food sciences and agronomy to economics, political sciences and other social sciences. Each discipline further brings its own vision, focus, concepts and interpretation of food security and nutrition issues, framed and focused by specific methodologies and approaches. Reinforcing, but also diverging, views can emerge from this confrontation of disciplinary approaches.

Second, agriculture, food security and nutrition have often been considered detached from other sectoral issues (environment, transportation, energy, etc.) in the past, but are now, in practice, increasingly interacting with one another. New issues can emerge specifically due to increased interdependencies.

Third, issues can emerge in the future and need to be anticipated, and not only dealt with *ex post*. This requires the use of specific methods, such as foresight tools, or horizon scanning methods, to perceive and document upcoming trends and identify emerging issues in an evolving context.

Fourth, contexts are continuously changing and issues vary over time, as well as the knowledge about them, sometimes unexpectedly. Any attempt to identify, at one point in time, a range of present or foreseen issues, will thus have to be recurrently updated.

Fifth, and finally, knowledge on critical and emerging issues comes from science and academia, but also from the experience of social actors, and from field practice. The HLPE recognizes the need to acknowledge and work with diverse, evidence-based, knowledge systems, while accepting the real challenge this objective presents, *inter alia* when it comes to assessing the quality and validity of diverse knowledge systems, and to find ways to confront and compare them and their results.

A systems approach

Given the above considerations, and also following a review of the methods and approaches used in similar exercises in related fields (such as Sutherland *et al.*, 2009, Sutherland *et al.*, 2010, Sutherland *et al.*, 2011, Sutherland *et al.*, 2013,; Pretty *et al.*, 2010, Foresight, 2011), the Steering Committee of the HLPE crafted a specific, dedicated process to answer the request from the CFS.

The process developed by the HLPE is grounded in a systems approach. To identify issues, the HLPE Steering Committee (StC) first considered, as a key criterion, the end of the causal chain: the *impact* of issues on food security and nutrition. The StC considered the various causal links through the system from issues to impacts, the diverse nature of these causal links (economic, political and social), and took into account that each of them can be described in different ways within the field and with the tools of different academic disciplines and different knowledge systems. Essentially, the process recognizes that food security and nutrition are influenced by various parameters and that a wide range of viewpoints is necessary to get the full picture of the issues that are shaping food security and nutrition today (see for instance <http://www.gecafs.org>)

The process started with establishing a set of criteria to assess issues as being “critical” and/or “emerging” in terms of their impact on food security and nutrition:

- systemic: system-wide relevance and/or implications;
- nutrition: issue includes nutrition-related aspects;
- depth: the extent to which the issue is relevant to food and nutrition systems as a whole, or to specific parts of those systems;
- breadth: how many people are affected;
- time-frame: the urgency of the issue, or the risks of negative effects increasing over time if intervention is not made rapidly;
- acceleration: an issue that is likely to increase rapidly in importance within a relatively short time;
- gaps in knowledge and understanding: an issue for which knowledge and the synthesis of knowledge to inform decision-making and society as a whole are lacking.

The first four criteria above enable assessment of how “critical” an issue can be. The last three criteria enable an appreciation of the time dimension and the solidity of knowledge (including knowledge gaps), to seize the “emerging” character of an issue.

A questionnaire was then devised to solicit inputs: the description of issues, of their main attributes, of their impact on food security and nutrition according to the criteria above, and the evidence base backing the whole.

The questionnaire was directed to the scientific community as well as to the diversity of knowledge networks and knowledge holders, and sent to a list of 77 institutions, organizations and knowledge networks of global and regional importance. Furthermore, the HLPE ran a public electronic consultation to allow any interested knowledge holder to participate as well. The CFS Bureau and Advisory Group were also informed of that consultation. The information was publicly posted on the HLPE Web site.

In total, 132 issues were collected from 53 different contributors: 25 knowledge institutions replied to the solicitation, submitting a total of 90 issues, and 42 issues were received from 28 different sources through the public inquiry. The HLPE gratefully acknowledges the time and contributions of all participants.⁴

Selecting a set of issues

The HLPE Secretariat summarized the results of the Inquiry in a synthesis document, available on the HLPE Web site together with the full proceedings.⁵ The synthesis proposed an organized mapping of all the issues received, identifying ten broad thematic areas (systemic, resources and environment, consumption, production, economic organization and trade, social, governance, conflicts, crisis, knowledge) within which subgroups of issues were further formed.⁶ Based on this, a set of five issue clusters was then identified, taking into account the attributes of the various issues presented in the Inquiry and their interrelationships.

- Changing consumption patterns and food and nutrition security
- Natural resources and food security
- Livestock and food security
- Social changes in agriculture and food security
- Evolution of food systems, urbanization and globalization and food security

The full list of issues, the five clusters, as well as the nine issues that have already been themes of HLPE reports,⁷ served as the starting point for an iterative process, based on the criteria, by which the HLPE Steering Committee converged to a short list of major issues. This process of convergence also included considering gaps, refining the description of issues, capturing how the issues relate to each other, how they link to other issues (often as drivers), as well as how widely they link to the broad range of thematic areas. In doing so, Steering Committee members drew on their multidisciplinary background and diversified experiences, as well as on the existing reports of the HLPE. The Steering Committee considered that the nine issues that have already been the object of a request by the CFS for an HLPE report should *de facto* be included in the list of critical and/or emerging issues, let alone because the CFS already included them within its policy agenda.

The final list was also crafted with a view that taken all together the issues should cover as wide a field as possible.

⁴ During the HLPE’s meeting in May 2014, the StC also held a public discussion with interested researchers, knowledge-holders and stakeholders at the University of Pretoria, South Africa. The discussion enabled, among other points, the highlighting of the importance of the social dimension of many issues.

⁵ The Synthesis of the Inquiry as well as the full proceedings are available www.fao.org/cfs/cfs-hlpe.

⁶ Systemic: systemic and complexity, development. Resource and environment: climate change, land, water, marine/aquatic, energy, genetic resources. Consumption: food demand, nutrition, food safety. Production: production general, losses, animal production, plant production, production systems and innovation. Economic organization and trade: trade, food chain organization and markets, finance and credit. Social: migrations, employment, social protection, gender, youth. Governance: governance and rights. Conflicts and crisis. Knowledge: data and knowledge generation, research, education, training, capacity building.

⁷ Price volatility and food security, land tenure and international investments in agriculture, food security and climate change, social protection for food security, biofuels and food security, investment in smallholder agriculture for food security, sustainable fisheries and aquaculture for food security and nutrition, and food losses and waste in the context of sustainable food systems, water and food security.

This iterative process, run in several sessions during a three-day Steering Committee meeting, led to the following list of five key issues, complementing the list of nine issues for which the CFS already requested an HLPE study to inform its policy debates:

- Healthy nutrition in changing food systems
- Livestock systems and food security and nutrition: challenges and opportunities
- Inequalities and food security and nutrition: the imperative of addressing the needs of disadvantaged and vulnerable populations
- The increasing role of financial markets in food security and nutrition
- Pathways to sustainable food systems: the pursuit of human and environmental health for all

Each of these five issues adopts a different perspective from which to consider major systemic changes that have an incidence on the capacity to ensure food security and nutrition, and which need to be brought to the attention of policy-makers. Taken altogether, including their interrelationships, the issues embrace many if not most of the most dynamic and important issues for food security and nutrition, in the various thematic areas identified above. The first four issues crystallize major trends that challenge the ability of food systems to ensure food security and nutrition. The first issue explores diet and food consumption changes as linked to the evolution of food systems. The second issue is related to one of the most important components of these dietary changes: the increase of livestock products' consumption, which creates opportunities but also increases pressures on natural resources. The third recognizes that persistent, and in some cases increasing, inequalities in access to natural resources as well as to available income to access food are a major challenge to ensure FSN. The fourth is the most emerging phenomenon pertaining to the trends of globalization of food and of its increasing links with non-agricultural commodities and with financial markets. The fifth issue encompasses all the other issues by questioning how best to jointly address these challenges, as well as others, in a sustainable way, in a context of limited resources.

In coming to this short list of issues of global as well as local relevance, and as also attested by the breadth of the feedback received by the HLPE as part of the Inquiry, the HLPE acknowledges that policy-makers might be confronted in practice with many more issues, and that different priorities might appear in different contexts, according to specific regional, national or local situations.

For each of the five issues identified, the HLPE StC further detailed the description⁸ of the issue itself and its relationships with other issues, see sections 1 to 5 below.

⁸ Given the purpose of the present document and the breath of each topic, the Steering Committee decided to considerably limit its mention to references in the following description of the issues. A more extensive list of references, among the often very wide number that can be of use to document each issue, can be found in the full proceedings of the Inquiry (available online at www.fao.org/cfs/cfs-hlpe).

1. Healthy nutrition in changing food systems

A food system includes all the elements (environment, people, inputs, processes, infrastructure, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes (HLPE, 2014a). Food systems remain diverse although they are converging around the world as a result of globalization (see issue 4 on financial markets below). The speed of these changes, and the uniformity of their direction – the diversion of cereals to meat production, for example – and the increased consumption of more highly-processed food, distributed through fewer and more centralized channels, lies behind the profound dietary changes witnessed in the last 20 years.

There are many food systems, often co-existing in the same country and even city. One estimate suggests that agri-industrial food systems now account for 40–45 percent of food consumption while traditional systems account for 50–55 percent (Rastoin and Gherzi, 2010), but the distinction is hard to make in practice. Urbanization leads to obesogenic diets and behaviours. It has concentrated food demand, while incomes have risen rapidly, particularly in large parts of Asia. These trends have significantly influenced the evolution of food systems, including how food is sourced and how it is marketed to consumers. For example, contract farming has increased significantly, as has the involvement of food retailers in production. Market concentration among commodity traders and processors has increased, together with the rapid expansion of supermarkets in most regions of the world (Colonna, Fournier and Touzard, 2013; Reardon, Timmer and Minten, 2012). New processed convenience foods appear continually and the number of fast-food outlets continues to expand. Interrelated changes in diets and food systems have led to a rapid transition in human diets across the world. The rapid transition in diets towards “western diets” in many countries have been linked to the global trends of trade, urbanization, food marketing and multinational food industries’ growing influence, as well as mass media and lifestyle changes (Popkin, 2006). Large food processing companies have transformed the way by which many consumers obtain and consume their food as well as diets, and not all of those changes have benefited public health. The increased availability of a limited number of major crops has led to easier access to cheap, energy-dense food. Good analyses of these phenomena are available, for example in FAO’s *The State of Food and Agriculture* report (FAO, 2013a).

While historically food security concerns have focused on total calorie intake, there exists today a triple concern, which is the triple burden of malnutrition, consisting of deficiencies in dietary energy intake (hunger), estimated by FAO to affect some 842 million people worldwide;⁹ a second burden in the form of nutrient deficiencies, such as iron, iodine and vitamin A, which affect some two billion people;¹⁰ and, a third burden from the rapidly growing number of people who are overweight, estimated by the WHO at 1.4 billion adults (35 percent of the world’s adult population) in 2008, of which 500 million (11 percent) were obese.¹¹ In addition, 40 million preschool children were suffering from overweight or obesity in 2008. These categories overlap: both calorie deficiencies and obesity can co-exist with nutrient deficiencies, while nutrient deficiencies can occur in people who have an appropriate calorie intake. Nonetheless, the implications of both our improved understanding of the importance of nutrition and the rapid growth in the incidence of overweight and obesity in both developed and a number of developing countries creates a new food security challenge for governments, one that will not respond to food security policies that focus only on calorie intake.

While a multifaceted approach is needed to solve existing and expected future nutrition problems, changes in the food system will play a major role in tackling the triple burden (Herforth, 2012; Pinstrip-Andersen, 2014). It will not be enough to seek solutions to the problem only at consumer level, with education and dietary advice. Consumer practices are influenced by many contextual parameters. Choices made at each stage of a food system matter. Yet the evolution of food systems is guided by the sum of the objectives of a wide variety of actors. Improved health and nutrition is only one among these many objectives. In tension with this goal is the need for economic viability, for example, which includes a drive to cut costs and increase efficiency. Moreover, improved health and

⁹ Estimates for 2011–2013 from FAO’s online hunger portal, accessed 25 June 2014 (available at <http://www.fao.org/hunger/en/>).

¹⁰ Estimate for anaemia worldwide from WHO, accessed 25 June 2014 (available at <http://www.who.int/nutrition/topics/ida/en/>).

¹¹ WHO Fact Sheet No. 311, reviewed May 2014, accessed 25 June 2014 (available at <http://www.who.int/mediacentre/factsheets/fs311/en/>).

nutrition is frequently subordinated to other goals, in part because there is a lack of empirical evidence about how best to achieve it. If farmers, food processors and other actors in the food system are to pursue health and nutrition goals, these goals must be integrated with other goals of equal or greater importance to the actors concerned.

Understanding how food systems can contribute to healthier food outcomes was perhaps the issue most consistently raised in the questionnaires completed in the preparation of this note. The contributions related to health touched on many issues, including the need for more balanced and healthy diets and to improve nutrition. A number of the questionnaires focused on healthy diets for vulnerable people, including those in much of Africa and emerging middle-income economies. The questionnaire responses point to the need for adequate dietary diversity to improve the nutrition of low-income populations, including those living through crisis. In times of high and volatile food prices, the nutrition of low-income households deteriorates, and future capacities are put at risk (education is curtailed, productive assets must sometimes be sold, and so on). Because of the life-long implications of poor nourishment at the start of life, respondents singled out childhood malnutrition as particularly important.

An acceleration in the nutritional transition

Some regions have significant populations experiencing each of the three categories of unhealthy diets: undernutrition, micronutrient deficiencies and obesity. The growing prevalence of unhealthy diets, obesity and diet-related non-communicable diseases is occurring even as hunger and malnutrition persist in different segments of the population.

Economic growth and rising incomes tend to lead first to an increase in the amount of food consumed by individuals and their households and then to an increased diversity in their diets. In turn, this drives an increase in the production of processed and animal-based foods, with implications for crop choice as demand rises for animal feed and for the ingredients for processed food, particularly sugars and fats such as high fructose corn syrup and palm oil (see the discussion on livestock systems under issue 2 below).

Energy-dense foods based upon a limited number of crop commodities and processed products have been associated with the rise in the incidence of non-communicable diseases that are linked with obesity. This trend is also connected to the reduced fibre and nutrient content of diets, in turn contributing to increased nutritional deficiencies. Looking at short- and mid-term tendencies, we have to take into account the effects of climate change on food systems. With increasing environmental uncertainty, the resilience of food systems will become a crucial important feature. Food systems and diets are likely to be affected through crop productivity and changing water availability, as well as increasing commodity price volatility linked to climate change (Wheeler and Von Braun, 2013).

Changes in the relative prices of different foods have also been significant and played an important role in the increasingly nutritionally unbalanced diets. Over time, the cost of sweeteners and fats has decreased significantly as compared with the cost of fresh fruit and vegetables. All those elements converge to favour a very rapid evolution of diets. Part of what makes health and nutrition so urgent is the speed at which the nutritional transition is occurring and its geographical reach. Although the level of hunger in the world population has fallen, unhealthy diets have not diminished; on the contrary, for billions of people in all parts of the world, micronutrient deficiencies and obesity have emerged as critical issues. As a result, countries need to rethink food security and nutrition strategies system-wide and to develop integrated intersectoral policies.

Tackling malnutrition through a food system approach

Viewing food security and nutrition from a food systems perspective allows a consideration of the interlinkages between various production and consumption models and their impacts on nutrition and health. Past efforts to address the problems arising from unhealthy diets by focusing on nutrition education at the consumer level alone have had limited success. Healthy diets should provide adequate consumption of the macronutrients containing energy (carbohydrates, proteins and fats) and of the micronutrients (vitamins and minerals) that are essential for physical and cognitive growth and development (FAO, 2011a). A food-based approach to health should also help in dealing with chronic health problems, such as tuberculosis and HIV/AIDS. To target healthy diets, governments have to understand how agriculture and different food systems intersect with nutrition and health.

The problem calls for reshaping food systems, inclusion of nutrition-sensitive approaches in agricultural policies and projects, ensuring a diversity in the choice of crops and other farm products, an assessment of possible measures for enhancing soil micronutrients through including micro-

nutrients in fertilizers or by using agro-ecological approaches, as well as promoting more sustainable diets and food systems and developing nutrition education at all ages. It will require a better understanding of the drivers of food consumption changes.

For those relying mainly on traditional food systems, there are important opportunities to improve nutrition through access to a balanced diet, a healthy environment (in particular, clean water) and a focus on reducing the time burden of the household tasks traditionally expected of women (Herforth, 2012). In fact, sanitation can be critical as unhealthy people have more difficulties in correctly feeding their families. In addition, efforts should be made to further diversify food supplies (Khoury *et al.*, 2014). For that, developing agro-ecological farming systems can encourage the planting of more diverse crops and help prevent the decline of healthy diets (David, 2009). Biodiversity can play an important role in sustainable and agro-ecological production, as well as in enhancing nutrition (Fanzo *et al.*, 2013). Biodiversity and food are also closely linked with the cultural and spiritual aspects of food and this can be taken into account to promote more nutritious diets.

In most countries, in particular in developing countries, there are multiple pathways linking food systems and nutrition because several food systems co-exist (Pinstrup-Andersen, 2014). Subsistence households are largely (if rarely entirely) self-provisioning and the dominant pathway lies in choice of crops, the quantity of food produced, in the time available for food preparation, and in patterns of consumption. The large majority of households worldwide has some level of engagement with the market economy: at the lowest level of integration, households grow food for the household's direct consumption, buy and/or sell some foods, mostly raw ingredients. Moving along the continuum, as disposable income rises and/or as time or opportunity for cooking in the household diminishes (for example, access to a kitchen or affording cooking fuel can be difficult for urban slum dwellers), households tend to consume more processed foods and foods cooked outside the house. Engagement in the market opens additional pathways between nutrition and food systems: household purchasing power starts to matter, especially relative to other buyers in the local market, as does the quality of the food for sale in the market. Food safety and the quality of food processing matter more. Gender-specific time demands remain important, especially as women are drawn into labour markets and find their time stretched thin by competing demands from the productive and reproductive functions.

These pathways have to be understood in their local context before proposing policies. The issue of inequalities has certainly to be looked at (see the discussion in issue 3 below), as well as other factors, including losses and waste, nutrient losses at different stages from the field to the plate, the decline in the diversity of diets, and consumers' behaviour. In fact, the local environment in which the consumer lives (including factors such as the distance between household dwellings and fast-food outlets, local shops and access to education) has to be looked at as much as the choices available in the market and the physiological conditions of each person (such as the microbiota in their gut) (Guillou and Matheron, 2014).

Knowledge gaps

There is now much evidence of the health and nutrition implications of different food systems across a wide range of scientific fields. That knowledge needs to be synthesized to better understand how to shape and to address pathways to healthy nutrition. This effort should help to identify what changes are needed in food systems to improve diets, apart from efforts to increase supply, and how to improve nutrient density and increase the diversity of what is produced and marketed. What are the determinants (physiological, sensory, social, policy and so on) of the changes in consumption? How do the dynamics of the food processing and retail sector drive consumption patterns? How should governments and societies promote healthy behaviour and build new social norms? How can they build on the diversity of the existing systems instead of encouraging uniformity? What is the role of public policy in promoting healthy, nutritious and culturally appropriate food for all? How can governments and societies promote, encourage and protect healthy diets through sustainable production and processing that promotes nutrition? What action should different stakeholders, including governments, civil society and the private sector, take? Improved understanding of the pathways between various parts of the food system and human health and nutrition and how they may be altered by behavioural and policy changes is urgently needed, which in turn will require integrated analyses and interdisciplinary research, neither of which is sufficiently well-developed. These insights would have a high health and nutrition pay-off and would strengthen food security.

2. Livestock systems and food security and nutrition: challenges and opportunities

Rapidly escalating production of animal-sourced food offers the potential for transformational improvements in FSN by boosting access to vital protein and micronutrients for millions of poor people and providing income and employment opportunities, including for the estimated 70 percent of the world's 1.4 billion poorest people who depend on livestock for their livelihoods (FAO, 2009). At the same time, the sector's expansion is implicated in unhealthy overconsumption of some forms of animal-sourced food (ASF), especially but not only in developed countries. Intensive livestock production systems require high levels of investment in technology, which are easier for large-scale operations, and with the risk of smallholders not being able to benefit from these opportunities. In addition to the human health concerns linked to excessive consumption, the production of livestock products gives rise to significant environmental stress, including high greenhouse gas (GHG) emissions and the pollution and degradation of soil, water and air. These significant environmental costs of intensive production systems are not internalized in prices. Confined animal feeding operations, in particular, are associated with such externalities, as well as with animal welfare concerns. They can be low polluting with appropriate investments and technologies. Public policies and subsidies are not often focused on smallholders. The risks and opportunities of livestock systems are significant and action is needed now to rebalance the role the sector plays given projected increases in production and consumption.

Fifteen of the responses to the questionnaires addressed livestock systems and animal agriculture, making it one of the largest issues of concern for the group of respondents. The responses reflected the contradictions evident in assessing livestock systems, with some contributions pointing to the importance of the livestock sector as a way to eradicate poverty and improve both access to food and better nutrition, while others focused on the implications of the rising level of global consumption of animal-based foods, for example for global demand for cereals, as well as animal health and welfare concerns.

The issue is both critical and emerging: considerable scientific knowledge exists now to inform policies that could significantly reduce the harm caused by some livestock systems while increasing the positive outcomes for nutrition and for livelihoods that the livestock sector can provide. At the same time, accelerating demand for ASF is bringing in new drivers and changing the parameters of the problems, and the opportunities, created by the sector. New knowledge to understand these changes, as well as how they intersect with each other and with other FSN concerns, is essential to inform effective FSN policies.

Livestock systems are increasingly important in food systems, as production, consumption and trade trends show

Across the planet, livestock systems are central to the food systems. Meat, milk and eggs provide around 13 percent of the energy and 28 percent of protein consumed globally, with a higher share in developed countries (20 percent and 40 percent respectively) (FAO, 2009). Driven by population and income growth along with urbanization in developing countries, demand for ASF has escalated over the past few decades, in what is often called "the livestock revolution", and is projected to continue to rise strongly. The quantity and types of ASF consumed by different groups and countries vary but there is a distinct convergence between developing and developed countries overall. Globally, meat consumption has tripled over the past 30 years and is expected to double again by 2030 (Pingali and McCulloch, 2010). Meat and milk consumption are also rising faster than projected growth for any crop product (Smith *et al.*, 2013). Today's dietary transition in developing countries is moving significantly faster than it did historically in developed countries (Guyomard, Manceron and Peyraud, 2013).

On the supply side, ASF production has stabilized in developed countries but is growing quickly in developing countries. This is particularly marked in China and slowest in sub-Saharan Africa (Rae and Nayga, 2010). Production systems vary by commodity and country, from open grazing to mixed crop/livestock systems and the fast-growing confined intensive model, especially for poultry and pork. There has been a consequential hike in the use of "food for feed" with half the world's grains now used to feed animals (IAASTD, 2009), with increasing pressure on lands as a result. There is also a clear trend to closer integration between production and the supply of inputs, processing, marketing and consumer links in food supply chains. Concerns about concentration and constraints to competition are evident. Products are more highly processed and increasingly sold in supermarkets or

eaten outside the home. Significant informal markets co-exist with these emerging formal markets in developing countries.

While a very high proportion of ASF is produced and consumed within domestic borders, trade is growing and livestock products represented, in 2006, 17 percent of the global agricultural trade in value (FAO, 2009). Another important impact of ASF production on agricultural trade concerns international movement of feed. For some countries and regions such as the EU or China, availability of imported feed is vital for their livestock sector. Imports of feeds have risen faster than imports of ASF products. China's increasing meat production, and Asia's rising production and consumption more broadly, has effects on international grain and oilseed production and trade, for example (see Peine, 2013; Sharma, 2014). Trade distortions, including tariffs, quota restraints, and export and production subsidies, as well as food safety regulations, continue to constrain cross-border ASF movements. Exports are concentrated in fewer than ten countries, including some emerging economies in Latin America (beef, poultry), and Asia (poultry and eggs from Southeast Asia and East Asia as well as beef from India) (Rae and Nayga, 2010).

A food and nutrition security perspective

Livestock systems are a direct source of food and nutrition, contributing to billions of livelihoods, and are at the heart of many different social, cultural and political traditions. Animal-based foods make an important and positive contribution to health and nutrition through the provision of calories, protein and micronutrients. Keeping some livestock, especially for the poorest households, is also a way to keep capital, and often an essential means to escape poverty (FAO, 2009). At the same time, livestock systems can contribute disproportionately to environmental damage, biodiversity loss, harm animal welfare, and negative nutritional outcomes through overconsumption. There are also well-documented concerns about the dramatic decline in livestock genetic diversity due to the intensive production of just a handful of breeds (FAO, 2009). Recent emerging traits include the production of synthetic meat (called "schmeat", which is meat grown in a laboratory petri dish), which has led to controversies, with proponents pointing to the animal welfare and environmental benefits, and opponents pointing to the contribution to an "artificialization" of the food system.

A number of economic pressures, including urban expansion, crop agriculture expansion and the development of mining, oil and gas industries, have put traditional livestock systems at risk, including nomadic pastoralism and transhumance (seasonal migration from mountain summer pastures to winter plains). Nomadic pastoralism and transhumance are associated with a range of issues, from environmental management (for example, dealing with drought), animal disease control, biodiversity preservation, cultural heritage, positive economic externalities such as through tourism (Niamir-Fuller, 1999; Nelson, 2012), with overall effects that are generally positive if the system is properly managed.

The livestock sector occupies four-fifths of all agricultural land, one-quarter of which is used for feed crops (FAO, 2006, 2009). There is strong evidence that parts of the sector are associated with significant environmental problems, including serious land degradation, high levels of GHG emissions, water and air pollution and biodiversity loss, all of which carry obvious risks for FSN. Much could be done within existing production systems to cut GHG emissions (FAO, 2014) and improve efficiency in the production of livestock and feed, which would reduce pressure on land (Steinfeld and Gerber, 2010). In some fragile areas, de-intensification of production is needed. Ultimately, more far-reaching changes in food systems – from production through processing, distribution, consumption and waste-management – are needed to reduce pressures on the natural resource base and the planet's ecosystems (see issue 5).

On the human health front, FSN benefits from animal-sourced foods are potentially huge. Even small amounts of ASF provide protein and micronutrients that boost dietary adequacy especially for lactating women, children and immuno-deficient people. At the same time, growing numbers in developing and developed countries suffer adverse health effects from rising levels of overweight and obesity, with a slew of associated chronic diseases and some cancers that are associated particularly with excessive consumption of red meat and processed meat (Neumann *et al.*, 2010). The latest credible research advocates increased plant-based dietary content and limits to consumption of meat, especially in highly processed forms (WCRF/AICR, 2014) (see also issue 1 and the potential contribution of food and nutrition education).

Food-borne disease exacts a heavy FSN toll due to pathogens such as *E. coli* and *Salmonella*. Food in developed countries is thought to be safer than ever before (Randolph *et al.*, 2007), yet a number of countries have been rocked by widespread scandals, including the outbreak of bovine spongiform encephalopathy (BSE), primarily in the United Kingdom but also elsewhere in Europe, as well as

Canada, and Japan. There are serious risks, too, in poor countries where diarrhoea, much of which is attributed to animal sourced pathogens, is among the most common causes of sickness and death (Grace, 2011). Stronger animal disease control and prevention systems are needed in poor countries with risk frameworks that focus on actual risks not hazards (ILRI, 2012). The focus on development of livestock production also invites a closer monitoring and prevention of potential health risks for human health (zoonosis).

Perhaps most importantly, there are growing concerns about how the world's poor, including smallholder livestock keepers, can share in the benefits from massive growth in ASF consumption. Their reasons for keeping animals are multiple, but supply of nutrient-rich ASF ranks high. They do not always consume the ASF they produce but sell it to generate income, which meets other needs including lower cost food, education and medical services. Livestock are valued for risk management (they can offer counter seasonal earnings and are a resource when crops fail or prices fall); they serve as a store of wealth in communities that lack access to credit; they provide manure (which is used as fuel and fertilizer); energy in the form of draught power; employment especially of women; and are deeply integrated into social and cultural traditions in many parts of the world.

The links between production of ASF and FSN are very context-specific and are very important for smallholders (See the publications of the Pro-Poor Livestock Policy Initiative (PPLPI)¹²; HLPE 2013a) Positive experience in dairy sector transition in both India and Kenya (FAO, 2009) suggests that focused interventions can boost involvement in growing urban markets especially in the informal segment. Opportunities in small ruminants also offer positive prospects in sub-Saharan Africa (Randolph *et al.*, 2007). Tackling constraints to smallholder livestock productivity growth could boost both critical food provision and income for communities (Pica *et al.*, 2008) notably through improved feeding practices. So could support for access to credit, information and competitively priced inputs and markets for outputs. (Delgado *et al.*, 2001)

Knowledge gaps

FSN risks and opportunities abound in the livestock sector, which operates across a range of different scales and technologies that are associated with both positive and negative effects on environmental, social and economic priorities. Landmark FAO reports such as *Livestock's long shadow* and *Livestock in a changing landscape* (FAO, 2006, 2009) have been important in focusing attention on the challenges, especially for the environment. It seems unlikely that the demand-led "livestock revolution" will be reversed while incomes and population continue to rise. A fresh look at the issues from a food systems perspective is warranted, focusing closely on the FSN implications and scope for constructive actions by governments and other actors. In addition, while most analysis cites rising incomes and urbanization in developing countries as the reasons for recent increases in global ASF consumption, to what extent have supply driven factors such as industrial scale production played a role (see for example Rivera-Ferre, 2009)?

It is important for FSN that policy-makers better understand the differences among various livestock systems, the way the systems interact with each other, and how to ensure that FSN is protected and enhanced as livestock systems change. There is a strong case for work that reviews knowledge across the range of livestock systems and their dynamics, and that would draw conclusions about interventions that could contribute to improved FSN. This knowledge is especially important given the rapid acceleration of change in the livestock sector.

Additional questions include:

Which policy interventions might help extend nutritional improvements from ASF consumption while reducing unhealthy levels of overconsumption and waste associated with escalating demand?

How can existing and new knowledge on sustainable production be applied so as to reduce environmental stress associated with the sector across the full range of production environments? Are new measures needed to limit damaging environmental externalities generated by the sector?

How can policies support smallholder producers to maintain and enhance existing production and environmental advantages, for example through securing their access to land (including rights to the collective use of lands), access to credit, information on sustainable and productivity enhancing practices, mitigation of animal disease and food safety risks, and access to markets?

¹² <http://www.fao.org/ag/againfo/programmes/en/pplpi/research.html>

3. Inequalities and food security and nutrition: the imperative of addressing the needs of disadvantaged and vulnerable populations

Hunger has historically been associated with poverty. Poverty is still the main cause of hunger, but the causes of food insecurity are in fact complex and multifaceted (HLPE, 2011a b, 2012a b, 2013a b, 2014a b). Poverty is often the result of the superimposition of inequalities of different nature. The first observation is that food insecurity is not a question of food scarcity, but of unequal access to food, which results from inequalities of income and of inequalities of access to resources, gender and social inequalities, inequality of economic and political power, etc. The fact that significant disparities in food security still persist within and across countries is often the effect of a wide range of inequalities operating underneath.

The main dimension of inequality that is relevant to FSN is often the economic and income dimension. In turn, economic or income inequalities are often the result of other inequalities such as social inequalities, unequal access to resources, spatial inequalities, inequalities of power, education, health, and gender inequalities, that can amplify each other. These inequalities also operate, and often cumulate, at different levels, from a macro, national level down to the household and the individual level. A fundamental inequality exists between populations and individuals that are food secure and populations and individuals that suffer from hunger and malnutrition. And this situation of unequal access to food is in turn a factor of many other inequalities.

Very little attention has been paid to how these inequalities of different nature, and which operate at different scales, interact with each other to affect food security in its different dimensions: availability, access, utilization and stability.

Inequalities of access to natural resources and inequalities of income as key determinants of inequalities of availability and access to food

Unequal endowments in, and access to, natural resources, land, water, genetic resources etc., create fundamental inequalities. These exist between countries, and inside countries, between households and individuals. The main compensation for a country whose natural resources do not allow it “naturally” to grow enough food, is to invest to increase, by various means, its intensity of production or to buy some food from abroad, both options being very difficult to realize if other economic activities do not generate enough income. This is also true at the level of a farm and farming household. To counterbalance these effects, raising agricultural productivity will help, but will often not be enough.

Concentration of landownership in the hands of big agro-business or traditional feudal elites, to which large-scale land deals contribute, can condemn landless rural families to a life in poverty. Securing land tenure and improving access to resources, especially for landless families can be key to improving sustainable income opportunities in rural areas (ILO, 2013a).

There are also amplifying effects of environmental degradation, and climate change, on inequalities and vulnerability to food insecurity (UNRISD, 2010; ILO, 2013b). Most projections indicate that climate change will put some developing countries at greater risk of food insecurity, and that within countries the impacts of climate change on food security are also likely to be unequally distributed (McCarthy, Lipper and Ashwill, 2013).

Income can compensate for inequalities of access to resources, but it does not necessarily do so. The 2013 World Economic Forum ranked widening income disparities as the second greatest worldwide risk (WEF, 2013). Current trends in income inequalities have led, in some cases, to increases in food and nutrition security imbalances. Inequalities have emerged in recent years as a major concern, both on a global scale and within wealthy, middle-income and developing countries in nearly every region of the world (Beddoes, 2012; IMF, 2014; Oxfam, 2014). Significantly, India and China, together representing 40 percent of the world population, are among the countries that have experienced an increase of in-country inequality (BRICS, 2012).

Inequality of income has an effect on food security as the growth of the food demand, and the evolution of diets towards higher levels of animal products (see issue 2) in the wealthier part of the world population, leads, everything else being equal, to higher prices and disproportionate effects on the poor. This tension of global demand created by differences of purchasing power (including the use of agricultural commodities for non-food uses, such as feed and biofuels) comes at the economic disadvantage of the poor, and can create food insecurity – not because these populations are growing poorer, but because the others are growing richer. Rising incomes for some changes the relative value of food, as those whose incomes do not rise are left competing for a smaller share of the supply

(Amartya Sen's seminal work on famine describes this phenomenon very clearly; Sen 1981) The impact of rising food prices depends on whether you are a net buyer or net seller of food, and bears disproportionately on the poor (HLPE, 2011a), therefore exacerbating inequality.

Income inequalities often create health inequalities, and vice-versa. For example, according to some studies, obesity seems to be less common in more equal societies (Wilkinson and Pickett, 2009). In developed countries, obesity, as well as deaths from diabetes, impacts disproportionately on the poor. Inequalities in access to services such as education, health services and social protection amplify economic and social inequalities, with impacts on food security (HLPE, 2012a).

Gender inequalities

Economic inequalities, and inequalities of access to resources, are often linked to other more fundamental inequalities. There is substantial evidence linking gender inequality to food insecurity. Worldwide, an estimated 60 percent of undernourished people are women or girls (WFP, 2009).

Gender inequality both within households and communities tends to be hidden in income and wealth inequalities. The fact is that women perform 66 percent of the work done in the world, produce 50 percent of the food but earn 10 percent of the income and own 1 percent of the property (World Bank, 2011).

Gender inequality means that most women in most countries have less access to the essential farm inputs: land ownership and tenure, seeds and fertilizers, capital and credit, education and training, farm labour, and livestock. Inequalities regarding access to land and resources are striking. Though statistics are often unreliable, and gender-disaggregated data are scarce, according to FAO (2011b), women own as little as 5 percent of agricultural land in West Asia and North Africa, while in sub-Saharan Africa women hold approximately 15 percent of agricultural land. These constraints directly affect women's farm productivity. According to FAO estimates, if women had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent (FAO, 2010). This could raise total agricultural output in developing countries by 2.5–4 percent, which in turn would produce enough food, at least in theory, to reduce the number of people living with hunger in the world by 12–17 percent (FAO, 2011b). Gender inequality also implies that women have less power in household decisions, including those affecting food and nutrition security. Where women have a greater degree of control over income and budgeting decisions in low-income households, children's nutritional status is positively affected.

Inadequate nutrition is closely linked to poverty, and contributes to health and educational inequalities (UNDESA, 2013), which are themselves a cause of long-term economic and social inequalities. For instance, mother and child malnutrition during the first 1000 days from child conception have been shown to bring negative health, social and economic impacts during the whole lifetime.

Inequalities of economic, social and political power

The agricultural and food sector is characterized by a wide variety of scales, and diverse degrees of economic concentration at the various stages of the food chain (see issue 1). This situation often leads to inequalities within the food chain, especially between large-scale, organized actors (such as big grain companies and large retailers, see issue 4), and smallholders for whom collective organization is a challenge.

All these inequalities have a strong effect on the economic governance of the food system, which in turn generates inequalities of power. Counterbalancing these situations requires improving governance, including through more inclusive social participation and empowerment, with States playing a leading role in ensuring the human rights, including the Right to Food in the context of national food security.

High levels of inequality give a small group of wealthy people in society a privileged position. Such elites are able to maintain their political, economic and social privileges (Bartels, 2008). Top earners have the ability to influence political process and to perpetuate their influence. When inequality is high, perennially excluded groups are less likely to be able to influence decisions about resource redistribution or the provision of universal benefits. Sustained inequality can lead to low levels of investment in the provision of public goods and services.

The wealthier groups being generally urban, policies tend to favour urban populations. Inequalities between urban and rural areas can be very significant, with an impact on food security. For instance, in developing countries, on average 73 percent of urban dwellers but only 33 percent of rural

populations have access to basic sanitation facilities (WHO and UNICEF, 2006). This has direct implications for rural food security because of the importance of clean water and sanitation for health and food utilization. Technological and policy choices have often increased these inequalities and concentrated gains in the hands of large production units and landholders at the expense of smaller-scale producers and landless workers, leading to increased inequality in rural areas (De Schutter, 2014).

Measures of inequality that rank individuals and households by income often exclude inequalities based on ethnic or racial origin, religious grounds or inequalities linked to place. Economic development affects different populations in different ways. Even when economies are growing, different groups and regions tend to benefit at different rates. In many countries, including some developed countries, indigenous peoples, ethnic minorities and rural populations have not benefited equally from economic change, which has increased income inequality within countries. Some of these populations are also more vulnerable to certain risks. For example, indigenous peoples are particularly at risk from the impacts of climate change, due to their dependence on the environment and its resources for their livelihoods. The negative impact of climate change is destroying traditional food sources and habitats (vegetation, livestock and fish stocks), and forcing indigenous people in these regions to relocate to other territories (UNDESA, 2013).

In general, disparities between these vulnerable groups and the rest of the population have increased over time (UNDESA, 2013). When inequality widens, social tension increases and erodes the legitimacy of governments (ECLAC, 2010). There are higher risks of social unrest when those living in poverty are from a distinct race, ethnicity, religion or region (Østby, 2008). Social cohesion is an important factor for achieving higher growth rates and the sustainability of growth in the face of external shocks and affects the duration and social impact of economic downturns (Ferroni *et al.*, 2008). High levels of inequality may also undermine the realization of civil, political, economic and social rights, and the exercise of substantive citizenship. Inequality jeopardizes social mobility resulting in inequality of opportunities (OECD, 2011; IMF, 2014) and undermines social and political stability (Stiglitz, 2012).

In turn, poor social cohesion and social and political instability could have a negative impact on availability and accessibility of food if they result in a disruption of food supplies and of economic activity. Social groups that are most severely affected by social unrest and conflict such as those who are displaced during and after war are also disproportionately impacted in terms of their food security and nutrition (HLPE, 2012a).

Inequalities of various kinds, including access to water and land, can fuel conflicts. Conflicts, especially in areas in protracted crisis (FAO, 2012), are often both a cause and consequence of food insecurity, as the investigation of “food riots” and socio-political unrest following price shocks showed (HLPE, 2011a). Worryingly, such protests can by themselves increase food insecurity by disrupting distribution systems (World Bank, 2014).

Addressing the needs of disadvantaged and vulnerable populations

The majority of the hungry and malnourished are rural populations, most of whom are working in the agriculture sector. Therefore agricultural development is key to address these inequalities. Numerous contributions to the Inquiry have mentioned the need to address the needs of low-income and vulnerable populations, underlining that agriculture and the choice of development pathways can play a decisive role in abating hunger and poverty. Diversification through livestock has been shown to offer opportunities to escape poverty (see also issue 2). Facilitating access to markets can be key in poverty eradication (HLPE, 2013a). Poor communities would benefit substantially from some form of protection from abrupt and extreme price volatility (HLPE, 2011a). Many also point to specific impacts of various issues, such as climate change (HLPE, 2012b), on vulnerable populations.

More broadly, inequality is harmful to economic growth (Milanovic, 2011; IMF, 2014). Empirical studies show that countries with higher inequality are more likely to experience shorter growth spells. For example, recent research from *Africa Progress Report 2013* and from the IMF found that where inequality is lower, growth tends to be faster and more durable. While inequality threatens economic growth, economic growth at national, regional and global levels is intimately interconnected with enhanced efficiency and productivity in agri-food systems (ACIAR, 2014, p. 7). Moreover, high levels of inequality make it difficult to reduce poverty even when economies are growing (UNRISD, 2010). To reduce poverty effectively and sustainably, growth must be combined with sustained investments in human capital, such as education and health, and food and nutrition security, to ensure income and

non-income inequalities are minimized. Investment in sustainable food systems that reduce inequalities, is key (see issue 5).

Addressing the wide range of inequalities that women, small-scale farmers, indigenous peoples, slum dwellers, children and young people face will be a key step towards improved FSN.

One major concern facing many countries is the question of how to integrate youth into the formal labour market and promote equal employment opportunities and outcomes among young people. According to the ILO, nearly 75 million youth are unemployed around the world, an increase of more than 4 million since 2007 (ILO, 2012). This situation correlates with poverty and food insecurity among young people. However, a study of 22 African countries showed that 41 percent of working youth were food insecure, or had not had sufficient food on several occasions over the past year, implying that employment may be necessary but certainly not sufficient to assure food security. The level of remuneration is critical (AfDB/OECD/UNDP/UNECA, 2012).

Knowledge gaps

Policy-makers need a better understanding of how inequality in all its different guises links to FSN. As underlined in previous HLPE reports, there is a need to better understand how different dimensions of inequality (economic, social, access to resources and spatial inequalities, to education, health, gender inequalities, etc.) interact and what the implications are for FSN. The effect of technology and innovation on levels of inequality needs to be better understood and taken into account in their assessment as well as in the orientations of public research. Country circumstances will differ and understanding the extent of inequality and its causes will help in the formulation of policies that protect the universal human right to food and that protect against exclusion.

4. The increasing role of financial markets in FSN

Often described with the term “financialization”, the increasing role of financial markets in the production, distribution and retail of food has been commented upon widely by academics and other analysts, particularly since the 2007–2008 food price crisis (Clapp, 2012; Kerckhoffs, van Os and Vander Stichele, 2010; UNCTAD, 2011; von Braun, Algieri and Kalkuhl, 2014). Several responses to the questionnaire noted that continuing changes in the organization of the agrifood sector, changes linked to international trade and investment, are having major effects on food security and nutrition. The evidence of increased interaction among the prices of various commodities, particularly between food, feed and energy was underlined in the HLPE reports on price volatility (HLPE, 2011a) and on biofuels (HLPE, 2013b). The links between food and financial markets can be traced through the growth in futures contracts on food commodity markets and through changes in patterns of land investment (HLPE, 2011b).

Financial markets have come to play a role in many dimensions of food systems. They are evident in the well-documented phenomenon of land grabs, although there are many other drivers for foreign investment in land, in addition to the financial investors looking for a financial return on an investment (Murphy, 2013; Murphy *et al.*, 2012). Financial markets are also increasingly important in commodity markets. Speculation has long played a useful role in some markets by providing short-term liquidity for deals that otherwise would take months to complete. But newer instruments, such as indexed commodity funds, link a number of commodities together, shifting the investor’s interest away from prices in any given commodity towards risk-hedging investments in a bundle of unrelated commodities. There is still much disagreement on what effect, and how large an effect, these new instruments have (von Braun, Algieri and Kalkuhl, 2014).

Speculation in commodity markets has increased to such an extent in the last decade that some observers fear the resulting large volumes of sales increase short-term volatility and make markets more expensive, even if in the longer-term they do not affect prices. Higher levels of volatility make it harder to understand market fundamentals and higher prices also increase the amount of money farmers and traders have to put in escrow to secure their futures contracts (HLPE, 2011a). Financial markets are also central to the grain trading firms, where foreign exchange and commodity market hedging has always played a crucial role, but which has now been formalized into wholly-owned investment firms, which provide financial investment to third-party investors, blurring the once distinct role of hedgers and speculators in commodity markets (Murphy *et al.*, 2012).

The immediate consequences on food security and nutrition are not always obvious: finance is not an issue that easily correlates to numbers of people who are food insecure or employed in agriculture, nor to threats to production, such as climate change. And yet financial markets set the stage on which governments and other policy-makers must enact their policies, including policies directed at FSN. The rules of investment and finance are profoundly important in shaping economies and those economies’ interactions in international food systems.

The changing role of financial markets in land ownership, credit provision, food distribution systems and commodity exchanges has to be understood for governments to be able to answer such questions as: how to attract and maintain foreign direct investment and yet still protect the democratic interests of the country and promote the alleviation of poverty and food and nutrition security? How fragile is the international financial system? And if it is fragile, what does that mean for countries that depend on agricultural exports as a significant source of foreign exchange? What does it mean for countries that have to finance food imports from external sources?

Governance of the financial system remains overwhelmingly a developed country discussion, largely held within G7 and to a lesser extent G20 circles. And yet developing countries are integrated into international markets and have a significant stake in the system. None of this is easy to quantify in numbers of food-insecure or threats to production or distribution, but clearly the financial structures on which food systems depend matter (von Braun, Algieri and Kalkuhl, 2014, p.5, review some of the linkages).

Commentators have coined the term financialization to describe the shift in finance that has turned money from a form of intermediation (a way of valuing and exchanging goods) into an end in itself – making money from money itself. In agriculture, the phenomenon is not new: speculators have long played a role in commodity trade. Speculators are interested in buying low and selling high, but not in actually producing or consuming the commodities they trade in. They play an invaluable role, creating short-term liquidity that bridges the gap between a producer’s need to be able to finance production

and the commodity processor's reluctance to buy before the product is ready for market. But significant deregulation of commodity markets has significantly increased the space available to speculators, leading to fears that speculative interests are distorting the market signals that producers and consumers of commodities rely upon. One of the central instruments of this activity on financial markets is the derivative, which is a financial contract whose value is not based on an exchange of material assets but instead on an expected future price movement.

Financialization introduces new forms of "distance" in food commodity exchanges, as described by Jennifer Clapp (2014). This "distance" is in part referring to the fact that most investors are not interested in the exchange of any physical commodity. It also describes a geographical and political challenge. As Piketty (2014) shows, the management of redistribution of wealth at the domestic level is a delicate policy matter. Introducing foreign capital into this equation complicates the politics still more, tending to encourage local interests towards two opposing poles: some that are accountable only to the foreign investors and others who are dedicated to nationalizing the ownership of production.

Knowledge gaps

The role and extent of financial markets in food systems, and their effects specifically on access to food and nutrition, are poorly understood. What kinds of investments do the new commodity investors make in food and agriculture markets? Where and how are they affecting agricultural production, especially in developing countries? How are they affecting decisions on investment in the infrastructure for the distribution of food commodities? As global financial markets extend their reach into agriculture, how will their presence affect the financial interests of small-scale and landless agricultural workers (their access to credit, for example)?

The practices of banks deemed "too big to fail" and other large private financial institutions with global reach have given rise to significant concern among financial policy-makers, including the governors of national banks (Financial Stability Board, 2013). Governments are concerned that they do not have the appropriate regulatory framework for financial markets and many problems with the sector remain unaddressed. Understanding what is going on and how best to avoid the vulnerabilities and fragility of the current system is an urgent priority. More specifically, as regards FSN and the needs of low-income net-food-deficit countries in particular, the authorities dealing with international finance are from the largest, developed economies and their institutions are not open to the participation of developing countries. Yet developing countries are increasingly bound up in the fate of the system as a whole.

G20 governments have decided the creation of the Agricultural Markets Information System (AMIS) in 2011. AMIS covers a significant share of global production and trade in food commodities but is not fully comprehensive. Governments only provide data on a voluntary basis, and not all comply with the requests for transparency. Some governments are reluctant to share their data on physical commodities production and storage. Moreover, just four private commodity traders control anywhere from 75 to 90 percent of trade in the major food grains, and they face no obligation to be transparent (Murphy *et al.*, 2012). There is an urgent need for more transparency, not least to enable decision-makers to better understand how financial markets are affecting FSN, and how financial markets are affecting the behaviour of the dominant commodity traders.

The establishment of financial instruments and markets to manage commodity exports and sales, as well as food imports, remains an important objective in many bilateral and multilateral development assistance grants and loans. These instruments have the potential to provide greater price stability and transparency in transactions, but they remain an important area of concern as long as they depend on a global financial system that is itself inconsistently and inadequately regulated. Commodity trade is highly concentrated and highly specialized. Few countries, let alone low-income net-food-deficit countries, have either state officials or private companies that are able to enter international commodity markets as equals in either capital assets or knowledge so as to be able to trade on equal terms. This significant information gap gives rise to strong concerns about the scope for market distortions.

There is an inequality in what is at stake in food commodity markets, leading to different assessments of costs and benefits of engaging in international markets. Low-income net-food-importing countries cannot forego food imports, but private commodity traders are in business to sell to the highest bidder, with no obligation to sell to poorer customers. This can leave some countries unable to reliably access food on international markets. Governments need to consider how best to overcome this market failure at the international level, and how to restore trust in international trade as a mechanism to protect FSN.

5. Pathways to sustainable food systems: pursuing the dual goal of human and environmental health

The fifth issue concerns the sustainability of food systems as a whole, and particularly how to move towards sustainable food systems. This issue is related to the four previous ones, which are key concerns for the sustainability of food systems. It also relates to each of the nine thematic clusters and to nearly all the subthemes and issues that emerged from the Inquiry.

Sustainable food systems are food systems that ensure food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised (HLPE, 2014a).

Food systems encompass multiple scales, sectors and dimensions, and simultaneously affect and are affected by other systems. There is today a better understanding of what characterizes unsustainable food systems, in the economic, social and environmental dimensions. There is also a better understanding on why the unsustainability of food systems is the main reason for the existence of food insecurity and nutrition: if food systems do not perform adequately in their environmental, economic and social dimensions, food security and nutrition are threatened. A symptom of this is the fact that the majority of the hungry are food producers. Food production increases alone, without attention to impacts on natural resources and economic and social assets, will not achieve global FSN.

A plurality of food systems co-exists today, which generates a range of food security and nutrition outcomes and is associated with various economic, social, cultural and environmental effects. What is emerging is an understanding of what it means to view the food system holistically, *as a system*. There are visions of what sustainable food systems can cover, and an agreement on the necessity of more sustainable food systems, in a diversity of contexts. The main issue is how to get there, to identify the challenges and the priorities for solutions and action, within a long-term vision, taking into account the current state of food systems. Therefore there is a need to find and follow appropriate “pathways” to sustainable food systems.

The need to arrive at sustainable food systems

The food system, which some call “productionist” (Lang and Barling, 2013), has enabled a threefold increase in food production since 1945 (FAO, 2011c). However, it did not solve food insecurity and malnutrition. It also brought significant impacts on the environment and pressures on natural resources, including soil degradation and the contamination and depletion of fresh water supplies (Clough *et al.*, 2011; Strzepek and Boehlert, 2010; Pretty, 1995). It relies on the high output of a relatively small set of genetically uniform, high-yielding crops, reducing biodiversity to alarming levels, particularly agricultural-biodiversity (Zimmerer, 2014). Greenhouse gas emissions of agriculture have increased and are now an important contribution to global climate change (HLPE, 2012b; IAASTD, 2009; Vermeulen, Campbell and Ingram, 2012; IPCC, 2014; Wheeler and von Braun, 2013). Approximately one-third of all food produced is lost or wasted (FAO, 2011c; HLPE, 2014a). Globalized food systems tend to favour large-scale, increasingly consolidated, input-intensive industrial farms (often practising monocropping) and a concentration of industrial food processing, packaging and distribution businesses (Reardon, Timmer and Minten, 2012). It implies longer travel distances for food products. Unsustainable consumption patterns, such as those relying on a persistent demand for cheap food that does not reflect its full production cost, are significant drivers of the unsustainability of food systems (HLPE, 2011a; Foresight, 2011).

One key measure of the unsustainability of food systems is also that, comparatively with other sectors of the economy, food systems tend to employ low-paid, often informal labour, which is in itself a factor of food insecurity for these workers who are producing food and their families.

Sustainable food systems are systems in which agriculture is delivering more effectively on its interconnected socio-cultural, environmental and economic roles (IAASTD, 2009), and where short-term profitability and raising yields, often a main criteria for on-farm decision-making, are in balance with a number of additional objectives of resilience, including the long-term health of the land and livestock, and resilience to climate change (Godfray *et al.*, 2010). In sustainable food systems, external inputs and waste are reduced, as well as the carbon footprint (Pretty *et al.*, 2006; McMichael, 2011). Inputs and waste are better integrated with water and energy systems through a circular rather than linear economy of resource use and output (Jones, Pimbert *et al.*, 2011).

Identifying pathways

There are today significant calls for a fundamental shift in favour of more sustainable food systems. The main question is to identify the pathway by which the change will happen, in a specific context.

Identifying, in a specific context, this pathway, requires assessing the current state of a food system, and current underlying trends. It requires identifying priorities to be addressed for a desired state of the food systems, in the framework of a long-term vision, and the challenges towards reaching this state. It then requires identifying solutions, a process of transformation and a plan of action.

An urgent task at hand is to develop processes that enable this, and to support the full and effective participation of smallholder farmers and other stakeholders and rights holders to diagnose, analyse and arrive at an understanding of the diverse controversies, debates, challenges and opportunities for developing context-specific pathways to achieve the collective good of FSN through existing global food systems and/or alternative food systems. An equitable process will allow well-informed discussions to determine just how to analyse/diagnose and determine the steps to take to ensure movement towards development of sustainable food systems, and what kind of governance is needed to ensure them. Participatory action research can play a role in these processes, to leverage local knowledge systems for robust data, and more democratic participation of smallholders, indigenous peoples and marginalized/vulnerable groups in decision-making.

Current concerns about the capacity of food systems to ensure FSN into the future call for examination of diverse (in size, scale and other dimensions) and resilient food systems. Among the plurality of context-specific pathways, some of which are centred on the right to food (Rosin, Stock and Campbell, 2013; Borras, McMichael and Scoones, 2013; Zerbe, 2009).

Because of the inherent links between biological and cultural diversity in agro-ecological systems, the achievement of sustainability goals requires the support and inclusion of undervalued, diverse forms of knowledge and knowledge systems (e.g. traditional knowledge, civil society experiences, etc.), as well as diverse governance systems. Studies suggest that efforts to improve FSN should make use of existing and appropriate technologies using context-specific approaches, and should support more domestic and localized food systems (IAASTD, 2009; Kassam, 2009). Acknowledging the interdependence and range of sources for viable FSN approaches, studies also call for FSN initiatives to enable and support cross-sectoral advances in food systems, and community-based traditional knowledge systems and innovations by smallholders, pastoralists, indigenous peoples and others who are marginalized and negatively affected within global food systems but whose agro-ecological knowledge and practices tend to be resilient in the face of change (Johns *et al.*, 2013). Also, fundamental structural reorientations would be needed in order to address the additional strains (e.g. climate change, the loss of customary land rights, degradation of productive resources, etc.) that undermine these knowledge systems and practices.

Both institutional and technological innovations are urgently needed to unlock the potential of diverse pathways to sustainable food systems. This needs to mobilize gender-aware and nutrition-sensitive approaches, which support and strengthen smaller-scale, biodiverse, locally adapted agro-ecological food systems and which promote local and regional food consumption (IAASTD, 2009; UNCTAD, 2013).

Overcoming possible structural and other constraints that hinder the development of multiple pathways to sustainable food systems is a central challenge for FSN throughout the world. More work is needed to identify the determinants of institutional and technological innovation that influence the choices of food systems, the pathways that enable their development in different settings, and their impacts on FSN. The combined influence of these determinants requires systematic and critical analysis (e.g. of land-ownership patterns, research funding priorities, rights over seeds and natural resources, public sector policy for food and agriculture, economic incentives, private sector policy, public-private sector partnerships, investments, climate change, etc.). The outcome of the interactions between these determinants of innovation needs to be carefully analysed to understand how – and under what conditions – new pathways to sustainable food systems can emerge to enhance food and nutrition security in a context of uncertainty and rapid change.

Knowledge gaps

More multidisciplinary and cross-sectoral strategies are needed for further, in-depth examination of approaches or “pathways” to sustainable food systems.

What are the sizes, scopes and cultural dimensions of various food systems on this spectrum? What are the policies, institutions and other factors that move the pathways forward, in rural, urban and peri-urban settings? What are the constraints and the enabling factors?

How to simultaneously promote sustainable production, consumption, governance and livelihoods? How do they interact, and how to determine if any of them take precedence over another?

Through participatory processes of discussion, diagnosis and analysis, the knowledge gaps that could be examined include: How are various food systems (including smallholder and traditional food systems) addressing debates, challenges and opportunities of functioning and evolving through rapid change? What methodologies are possible to determine the true environmental, social, cultural and economic costs and benefits of food systems? What are the successes in educating consumers about the global impacts of their food/food price demands? How to ensure that seemingly national/local/household-level decisions also take into account the broader impacts of those decisions?

Given that nourishing oneself is not simply an insular act taken by an individual, but rather part of a shared and complex system, how are various food systems re-connecting consumers with land and with food producers? Which practical pathways are currently being used to achieve food system sustainability, such as to increase resilience to the impacts of climate change, reduce inputs and transport, and minimize food losses and waste (e.g. which pathways are significantly reducing or eliminating the use of synthetic pesticides, shortening value chains, shifting emphasis to benefit more local markets and the food insecure, applying a holistic food chain approach that incorporates energy-efficient, small transport, transformation and distribution options)? How do pathways to sustainable food systems optimize the use of diversified crops and local varieties rich in micronutrients to improve food security and nutrition?

What kinds of social and economic opportunities have emerged through the adoption of sustainable food systems that acknowledge and support the nutritional, economic and socio-cultural value of food, and that improve livelihood outcomes? What are the possibilities for broader application and adaptation of these or similar solutions in diverse contexts? What governance structures and systems are in place to maintain sustainability of food systems to enable food security and nutrition in the long term?

Well-informed choices need to be made for FSN to be more inclusive of smallholders, indigenous peoples and marginalized/vulnerable populations. It is crucial to better understand the diversity of food systems and their comprehensive impacts on one another, as food (and water) demands accelerate and are complicated by pressures such as climate change, land grabbing, commodification of water and unsustainable development. A number of food system analyses have concluded that the socio-cultural and economic resilience of smallholder farmers', pastoralists' and indigenous peoples' food systems needs to be strengthened, enabled and supported (Johns *et al.*, 2013; FAO, 2013b). What kind of fundamental structural re-orientations are needed to achieve this, particularly in the context of climate change? And in addition to their inherent FSN value, how do these particular food systems contribute to the dual goal of human and environmental health more broadly?

It is also necessary to examine fundamental differences in governance regimes and their policy instruments, legislative frameworks, institutions and other features. How do they compare in enabling the use of land (including indigenous peoples' collective use of lands and territories), seeds and other productive resources? And what are the policy interventions and investment approaches that could strengthen FSN by leveraging untapped pathways to sustainable food systems?

Considering the imperative of a systems approach to improve FSN, and the rich possibilities presented by seeing food systems as dynamic behavioural systems with interdependent actors and components (Pinstrup-Andersen, 2012), it is critical to ask and analyse: what are the impacts of all actors in sustainable food systems, including food producers, consumers and others who play vital and specialized roles throughout the food system? With respect to opportunities to enrich food systems research and policy-making, how can collaboration with social scientists be strengthened?

6. Final thoughts

Policy-making is influenced by many factors, and a strong, comprehensive, relevant and timely evidence-base contributes to appropriate choices and design of policies and to the likelihood of these policies achieving their stated goals.

Since its reform, the Committee on World Food Security has already worked on many issues of critical and emerging importance for food security and nutrition. For nine of them, it asked the HLPE to provide comprehensive evidence-based analysis and advice, and a dedicated report to serve as a starting point to support CFS multistakeholder debates.

In this note, the HLPE has identified five additional critical and emerging issues of major importance for today's and tomorrow's world food and nutrition security.

Should the CFS decide to inscribe these issues in its programme of work, the HLPE stands ready, in line with its mandate, to work at the request of the CFS on reports to feed into and support the relevant CFS activity.

Any process is limited by constraints of time and resources. This process was tailored to accommodate the resources of the HLPE and the calendar of the CFS. The HLPE Steering Committee is committed to use this process as a learning exercise, with a view to improving the methodology for the future. It is a continuous challenge to be able to integrate the wide diversity of formal knowledge systems, often organized around different disciplines in science and academia, with different methodologies and perspectives, as well as different objectives. There is an additional challenge to making progress towards the inclusion of other forms of expertise than those of the academia, which also have their own methodologies and objectives.

Finally, the HLPE Steering Committee looks forward to future iterations of this work, and will continue to reflect on improving its methodology, including among other things the ability to consult even more widely and more thoroughly with a broad array of stakeholders.

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