Secretariat HLPE, c/o FAO
Viale delle Terme di Caracalla
00153 Rome, Italy
Tel: 0039 06 5705 2762
Website : www.fao.org/cfs/cfs-hlpe
E-mail : cfs-hlpe@fao.org

High Level Panel of Experts on Food Security and Nutrition

2nd Note on Critical and Emerging Issues for Food Security and Nutrition

Prepared for the Committee on World Food Security

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HLPE Steering Committee members (May 2017)

Patrick Caron (Chair)
Carol Kalafatic (Vice-Chair)
Amadou Allahoury
Louise Fresco
Eileen Kennedy
Muhammad Azeem Khan
Bernardo Kliksberg
Fangquan Mei
Sophia Murphy
Mohammad Saeid Noori Naeini
Michel Pimbert
Juan Ángel Rivera Dommarco
Magdalena Sepúlveda
Martin Yemefack
Rami Zurayk

Coordinator of the HLPE

Nathanaël Pingault

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Introduction: objective and process

In October 2013, the Committee on World Food Security (CFS) requested the HLPE to produce a note on critical and/or emerging issues in the area of food security and nutrition (FSN). This first note, released in August 2014, defined a "critical" issue as *"an issue that has a profound influence on one or more of the dimensions of food security, either directly or indirectly, positively or negatively",* while "emerging" issues are those *"for which there are concerns that they could become critical in the future".*[1]

Issues vary over time, and new ones emerge as situations, political contexts and knowledge are continuously changing. Therefore, in October 2015, at its 42nd Plenary Session, the CFS decided that this HLPE note shall be updated at least every four years, depending on funding availability and the HLPE workload, and released in due time to be used as a starting point for political debates within CFS and for the process of elaboration of the following CFS multiyear programme of work (MYPoW). In this context, the CFS Bureau requested the HLPE to produce a second *"Note on critical or emerging issues in the area of food security and nutrition"* (hereunder referred to as the C&EI note), to be presented during CFS44 Plenary Session in October 2017. The process followed by the HLPE to elaborate this note is further described in the "*Revised concept and process note"*.[2]

Between August and December 2016, the HLPE conducted an enquiry directed to the scientific community, as well as to the diversity of knowledge networks and knowledge holders: consisting of a range of institutions and organizations. The HLPE proactively contacted around 180 knowledge institutions worldwide. In the meantime, a public electronic consultation was opened to a wider range of stakeholders.

Respondents were invited to fill out a questionnaire[3] for each critical and/or emerging issue they wanted to raise, in order to identify their main characteristics (including their nature, geographic scope, breadth, their linkages with the 2030 Agenda and their impact on the four dimensions of FSN, and their specific impact on women, children, vulnerable and marginalized groups).

In addition to this enquiry and public consultation, the HLPE organized or co-organized three conferences to allow a direct interaction between different knowledge holders and stakeholders to obtain inputs and feedbacks at different stages of the process (see section 1.3).

This note, endorsed by the HLPE Steering Committee, presents the results of this process. The first section describes the main results of the enquiry and public consultation, and relates the issues raised to the sustainable development goals (SDGs), as well as to previous HLPE reports. The second section presents the main issues that the HLPE Steering Committee considers important for future work.

1. Main results of the enquiry and public consultation

This section presents the main results of the enquiry and public consultation conducted by the HLPE.

1.1. Statistics and methodology

The enquiry and public consultation attracted 174 answers from 80 different respondents, totalling over 900 pages. The answers show the complexity and diversity of topics, either challenges or opportunities, related to FSN, and the diversity of situations across regions and countries, as well as the diversity of perspectives among respondents.

[1] See: http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/Critical_Emerging_Issues/HLPE_Note-to-CFS_Critical-and-Emerging-Issues_6-August-2014.pdf

[2] Available on the dedicated webpage: http://www.fao.org/cfs/cfs-hlpe/critical-and-emerging-issues/en/

[3] Available on the dedicated webpage (ibid).

In organizing those 174 issues, a structured methodology was followed, whereby each issue was analysed at different levels of granularity, from a more detailed "descriptive" analysis to broad "thematic clusters", as related to FSN.

All the issues were carefully screened in order to highlight common keywords and similarities in the topics raised, and thus evaluate their relative "critical" importance for the respondents. This first exercise led to a list of 46 keywords, hereunder called "subthemes". This list still reflected the huge diversity in the level of granularity of the answers received. Some of these subthemes such as climate change, were raised by many respondents and cover a wide range of different issues. Other subthemes identified, such as food fortification, are related to more specific issues. Some subthemes, although directly emerging from only one answer (such as "energy", "infrastructure", or "food sovereignty"), were kept in the list considering their importance for FSN and their potential relationships with many other issues.

In a second step, those 46 subthemes were grouped into six broad "thematic clusters":

1. Climate change and natural resource management,
2. Nutrition and health,
3. Food chains,
4. Social issues,
5. Governance,
6. Knowledge and technology.

Clusters 1, 3 and 4 gather challenges and opportunities closely linked to the three dimensions of sustainability (environment, economy, social). Cluster 2 shows an increasing awareness among the respondents about the multiple burden of malnutrition and links nutrition and health to sustainability through diets. Clusters 5 and 6 are related to the means of implementation and to the possible pathways or areas for actions proposed by the respondents.

Those thematic clusters should not be considered as *"critical and/or emerging issues"* by themselves. They are only meant to be a practical way to classify the issues, challenges, opportunities, problematics and controversies raised by the respondents. This classification was done in order to help the HLPE Steering Committee identify the issues it considers important for future work (see section 2), using this raw material (see section 1.2), as well as the inputs from the conferences (section1.3). Section 1.4 below shows in more detail the links between those six thematic clusters, the different SDGs, and the different dimensions of FSN.

For the sake of clarity, each issue raised by the respondents was associated to only one subtheme and each subtheme to one thematic cluster. Of course, other possible classifications could have been elaborated given the numerous interlinkages existing at different levels between issues, subthemes, broad clusters, SDGs and dimensions of FSN.

1.2. Synthesis of the issues, structured by thematic clusters

This section presents briefly those six broad thematic clusters. A more detailed synthesis of the answers received has been prepared by the HLPE Secretariat.[4]

1. <u>Climate change and natural resource management</u>

Climate change, increased climate variability and extreme weather events are considered to impact negatively on food security and nutrition, as well as on food production and livelihoods of farmers, disadvantaged populations and marginalized groups, including indigenous peoples and women. Availability, access and management of natural resources, including land and water, are seen as major challenges. Management practices and enabling environments for sustainable agriculture, as well as improvements in resource use efficiency are needed. Threatened ecosystem services are impacting on ecosystem health and resilience, limiting our

[4] Available on the dedicated webpage (ibid).

capacity to achieve sustainable agriculture in the long term. Biodiversity, agro-biodiversity and genetic resources play an important role for food security and nutrition and sustainable diets in the long term.

2. *Nutrition and health*

Malnutrition in all its forms – not only hunger, but also micronutrient deficiencies, as well as overweight and obesity – is identified by many respondents as a critical challenge not only in the developing but also in the developed countries. It affects the health and development of people, in particular vulnerable and disadvantaged groups, including children and pregnant or breastfeeding women. Addressing malnutrition requires a better understanding of the determinants and processes that influence diets as well as the impacts of changes in diets on different dimensions of sustainability (that include, according to some respondents, not only economic, social and environmental dimensions but also nutrition and health).

Some respondents highlighted the promotion of nutrition-sensitive agriculture and food systems and the development of appropriate technologies as part of the solution. Animal-sourced foods, including fish, also play an important role for nutrition, although their consumption is unequally distributed across countries and social groups.

Food safety (including microbiological and toxicological risks), and especially food-borne diseases, including transboundary risks and, more broadly, the impacts of current agriculture and food systems on human and animal health, are seen as critical challenges. Widespread use of antibiotics for livestock favours the emergence of anti-microbial resistance (AMR) that constitutes a major global threat to human health.

3. *Food chains*

This cluster gathers several issues that are related to agricultural production and food value chains. According to some respondents, and as demonstrated by HLPE reports (2014b, 2017 forthcoming) a food systems' holistic and intersectoral approach is needed because any action at one stage of the food chain can have direct or indirect impacts at other stages, for different stakeholders.

Sustainable production (agriculture and fisheries) is the first step towards more sustainable food systems. According to respondents, access to inputs (including physical inputs, information and credit), and to infrastructures and markets, in particular for smallholders, are considered as key conditions of sustainable production. Respondents called for the promotion and development of resource efficient and resilient agricultural practices (including sustainable intensification or agroecology).

The private sector, and in particular agriculture and the food industry, could potentially play a key role in the needed radical transformations of food systems, including in the reduction of food losses and waste all along the food value chains. Respondents highlighted the need to improve the nutrition outcomes of the food value chain and to mitigate the negative impacts of highly-processed foods that are linked to overweight, obesity and associated non-communicable diseases.

The increasing and evolving food demand, and in particular demand for animal-sourced food, will also contribute to shape the food systems in the coming decades. In that context, respondents called for more sustainable consumption patterns, in line with SDG12, and insisted on the importance of marketing and advertising in the evolution of consumers' behaviour.

4. *Social issues*

This cluster covers a wide range of very different issues. Among those, three subthemes ("conflicts and migration", "urbanization and rural transformation" and "youth") received from respondents more attention than during the enquiry for the previous HLPE C&EI note.

Conflicts and migration are seen as an emerging issue for FSN. Respondents highlighted the need to better understand the role of agriculture and food security in conflict and emergency situations, as well as the impacts of migration on nutrition. Food insecurity and malnutrition are among the root causes of rural–urban migration: agriculture and rural development can play a key role in harnessing this phenomenon for improved FSN.

"Urbanization and rural transformation" emerges from many answers as a critical driver of agriculture, land use and food system changes in the future decades. It is also seen as an opportunity to develop innovative practices adapted to the urban context (such as urban agriculture).

Employment and working conditions in agriculture and rural areas can influence the FSN of rural communities. Several respondents emphasized the key role that agriculture and rural development should play in providing opportunities and decent jobs for youth in rural areas.

Empowering women and closing the gender gap, while providing support to smallholders, are seen as critical for more sustainable agriculture and food systems and better FSN. Lastly, social protection systems and programmes can play a major role to reduce food insecurity, eliminate hunger and combat rural poverty.

5. *Governance*

Human rights, including the rights to water and sanitation and the right to adequate food, are seen by some respondents as the cornerstone on which to build global governance for better FSN. Among the challenges to be addressed, respondents list power relationships, power concentration, power imbalances and conflicts of interest within food systems, as well as the respective roles and responsibilities of different stakeholders (states, the private sector, civil society organizations, academia).

Strong institutions, capacity building and better enforcement of existing laws and regulations are presented as important conditions/tools for better governance and, finally, improved FSN. Innovative partnerships and participatory approaches are considered as promising. Policy coherence and coordination across sectors and scales will be key to address FSN-related challenges in an integrated and sustainable way. There are diverging views among the respondents about the impacts of trade policies on global and local food systems and about the contribution of food sovereignty and local food systems to improved FSN.

6. *Knowledge and technology*

Information, research and development, capacity building and education are presented as key channels to improve FSN. There are several promising innovations (either technological or institutional) in agriculture and food systems such as information and communication technologies (ICT), including big data, precision agriculture, adapted mechanical power, bio- and nanotechnologies.

However, there are diverging views among respondents on the most suitable technologies to improve FSN in a sustainable way in different contexts. All those technologies should be assessed against their social, economic and environmental impacts in the short and long term, and against their capacity to address specific challenges identified in different situations or for different populations. Some respondents noted the huge gap existing between available and accessible technologies, in particular for small-scale producers.

1.3. Inputs from the conferences

In addition to the enquiry and public consultation, the HLPE organized or co-organized three conferences to allow a direct interaction between different knowledge holders and decision-makers and to seek inputs and feedbacks at different stages of the C&EI process.

The first conference, co-organized with Columbia University, in New York City, United States of America, in May 2016, was an occasion to present the first HLPE C&EI note (2014) and discuss the process devised for the second edition.

Two other conferences were co-organized by the HLPE during the enquiry and public consultation with the broader perspective to contribute to advancing the 2030 Agenda for Sustainable Development. The first was co-organized with Hohenheim University in Stuttgart, Germany, in September 2016; the second, with Agropolis International and the UNESCO Chair on World Food Systems, in Montpellier, France, in December 2016. They gathered around 150 participants each, coming from the public sector, academia, civil society and the private sector, as well as from farmers' organizations.

The outcomes of these two conferences, available online,[5] present in more detail the five main issues that emerged from the discussions in Stuttgart,[6] and the six main issues raised in Montpellier.[7] These are consistent with the answers received during the enquiry and public consultation and with the thematic clusters identified above. Both conferences underlined, for instance, the growing competition for resources (land and water) likely to entail conflicts and migrations in the coming decades, as well as the importance of strong governance mechanisms to address power imbalances and power concentration within food systems.

The conferences also put forward some specific points that complement or reinforce the inputs from the enquiry and public consultation. For instance, the participants in Stuttgart recalled the importance of integrating diverse forms of knowledge; protecting indigenous peoples and other marginalized groups' food systems and related knowledge systems; and, applying a human rights-based approach to address FSN. When discussing social dimensions of FSN, the participants in Montpellier emphasized the importance of human dignity and, when discussing governance, they pointed out the need for territorial approaches at different scales.

1.4. Linkages to Agenda 2030 and the SDGs

The 174 issues raised during the enquiry and public consultation, as well as the issues raised during the conferences, are considered from a FSN perspective and are thus all directly linked to SDG2 (zero hunger). There are also numerous interlinkages at different levels between issues, subthemes and broad clusters. Previous HLPE reports also evidenced the links between sustainable development and the four dimensions of FSN.[8] Because of these interlinkages, most of the issues raised can be linked directly or indirectly to many if not all of the other 16 SDGs as well as to the four dimensions of FSN.

Therefore, rather than a detailed map of those multiple links, this section aims to provide a wider perspective and to show how the different blocks of issues raised, classified under the six thematic clusters described above, can be inserted in the overall framework of the 2030 Agenda, through the four dimensions of FSN (availability, access, utilization, stability).

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[5] Outcomes of these conferences are available on the dedicated webpage (ibid).

[6] (i) FSN in conflict areas and role of women; (ii) Capturing complexity and integrating knowledge systems; (iii) Ecologically sound, adaptive and resilient agricultural ecosystems; (iv) Adressing power imbalances to transform food systems; (v) Consumption patterns and sustainable diets.

[7] (i) Social dimensions of FSN, human right and human dignity; (ii) Agroecology; (iii) Organization of food supply chains; (iv) Territorial approach: governance at different scales; (v) Competition to access resources, exclusion, conflicts and migrations; (vi) One Health, animal welfare.

[8] See HLPE contribution to CFS for SDG2 review by the HLPF, available at: http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/CFS-Work/HLPE_contribution_to_CFS_for_SDG-2_2017.pdf

A first block of issues is linked to *food availability*. Those issues are mainly related to the biophysical environment and classified, in the detailed synthesis, under the clusters “Climate change and natural resource management”, including land and water, and to “Food chains”. They are directly linked to SDG6 (water), SDG7 (energy), SDG12 (sustainable production), SDG13 (climate change) and SDG14 (oceans), as well as SDG15 (terrestrial ecosystems).

A second block of issues is related to people and communities, in particular to the most vulnerable and marginalized, and describes the social and economic challenges that will impact FSN, and particularly physical and economic *access to food*. Those issues are mainly classified under the clusters “Food chains”, and “Social issues”. They are directly linked to SDG1 (poverty), SDG5 (gender), SDG8 (economic growth and employment), SDG9 (infrastructures), SDG10 (inequalities) and SDG11 (urbanization).

A third block of issues focuses mainly on *food utilization*, describing the challenges and opportunities linked to “Nutrition and health”. This block can be linked mainly with SDG3 (health) and SDG12 (sustainable consumption). The specific needs of pregnant and breastfeeding women, children under 1 000 days, and vulnerable groups must be considered here with particular attention.

The present context of climate change, emerging conflicts, migrations and forced displacement underlines the importance of *stability* (the fourth dimension of FSN) of the three first dimensions of FSN: food *availability, access* and *utilization.* Some of the issues raised focus directly on stability as a key condition for the achievement of the 2030 Agenda and particularly of SDG1 (poverty), SDG8 (inclusive economic growth), SDG10 (inequalities), SDG13 (climate change) and SDG16 (peace).

A last block of issues highlights the possible means of implementation of the 2030 Agenda, classified in broad categories: “Governance” and “Knowledge and technology”. Those cross-cutting categories are linked to all the dimensions of FSN, and to all the SDGs already mentioned, but they can be more closely linked to SDG4 (education), SDG16 (institutions) and, of course, SDG17 (means of implementation and partnerships).

1.5. Main issues raised during the process and previous HLPE reports

This section relates the issues raised during this process of identification of critical and/or emerging issues to previous HLPE reports in order to identify topics that could deserve further analysis and that have not yet been covered in depth by previous HLPE reports.

Climate change, land and water related issues have been covered in dedicated HLPE reports (reports #2, #3, #8), including from sectoral perspectives (in the reports on biofuels, fisheries, agriculture and forestry). However, topics related to the subtheme “Biodiversity and ecosystem services” would deserve further attention, particularly in the face of concerns regarding access to genetic resources and increasingly accelerated and amplified impacts of climate change on biodiversity that have been occurring since the 2012 publication of HLPE report #3 on *Food security and climate change.*

Sustainable production systems (fisheries, agriculture, forestry), as well as food losses and waste, have been covered in previous reports (#7, #8, #10, #11). The ongoing report #12 on *Nutrition and food systems* will complete these analyses and should cover many issues, related to food systems and to malnutrition in all its forms (hunger, micronutrient deficiencies and the increasing burden of overweight and obesity). Some of these issues, such as animal-sourced foods, including fish, or antimicrobial resistance, have already been introduced in reports #7 or #10. However, further work could be conducted on issues related to “food safety” and food-borne diseases, as well as post-harvest related issues.

All the previous HLPE reports have paid specific attention to gender issues, as well as to vulnerable and marginalized groups, including indigenous peoples. A report was devoted to social protection from a food security perspective. However, “Urbanization and rural transformation” and related social issues, including employment and working conditions, would

deserve deeper analysis. It could provide further insights on how to better integrate gender equality concerns into FSN programs and to understand the specific roles of women and youth to progress towards more sustainable food systems for better FSN.

Many issues related to "Governance" will be analysed in the future report #13 on multistakeholder partnerships. However, further work seems to be needed to better understand the positive and negative impacts of trade on FSN and to address power concentration and imbalances in food systems.

Although all the HLPE reports are knowledge and evidence-based, the potential contributions of knowledge and technology to FSN, as well as their limitations, have never been the core focus of any HLPE report. Such a study could provide useful insights: on the role of innovation and access to technologies in agriculture and food systems, as well as on the integration of diverse forms of knowledge, including traditional and indigenous knowledge.

Among the five main issues identified by the first HLPE C&EI note (2014), three have since then been addressed by HLPE reports. One issue, *"Increasing role of financial markets in FSN"*, has not yet been covered but has not been raised again by the respondents during this process. *"Inequalities and FSN",* that has been raised again by the respondents could also be the topic of a future HLPE report that would focus on economic and social issues and show the links between SDG1 (eradicating poverty) and SDG2 (eradicating hunger).

2. Main issues that need to be further considered

The results of the enquiry and public consultation, along with the outcomes of the conferences presented briefly in the previous section, fed the reflexions and discussions within the Steering Committee. Building on the results of this inclusive process, and considering the issues already covered by previous HLPE reports, the HLPE Steering Committee has identified nine main critical and/or emerging issues, presented in this section, that could deserve further attention. This would contribute to inform the fundamental changes in agriculture and food systems that are needed to address FSN and, more generally, sustainable development.

2.1. Anticipating the inter-connected future of urbanization and rural transformation

The share of urban population is increasing rapidly: from 30 percent in 1950, it is projected to reach 66 percent by 2050. This increase will be particularly pronounced in Africa and Asia. At the same time, the rural population is expected to continue to grow until 2050 in Africa, Oceania and in the least developed countries (UNDESA, 2014). In Africa, around 122 million young people are projected to enter the workforce between 2010 and 2020, and even under optimistic off-farm employment growth scenarios, one-third to one-half will need to find jobs in agriculture (Jayne *et al.,* 2014).

Although the majority of the world's poor are still living in rural areas, 63 percent of them working in agriculture (Olinto *et al*., 2013), and given the rate of urbanization in recent decades, an increasing share of world poverty is now located in urban centres: about 45 percent of the urban population in developing countries live in households lacking adequate space, solid construction, improved water, secure residential status or improved sanitation (UN Habitat, 2012). This trend is expected to continue, which will result in an increasing proportion of the world's poor living in urban areas within the near future.

The pace and intensity of such urbanization and rural transformations highlight the need to address the interconnected future of cities and rural areas through inclusive policies at territorial, national and regional levels. They also call attention to the capacity of cities to act as a powerful driver of change and innovation in both urban and rural areas. Those transformations will impact FSN and the so-called nutrition transition (IFPRI, 2017), locally and globally, and will shape agriculture and food systems for the next decades, raising in particular the following sets of critical questions:

- How to feed huge cities? How reliance on global vs local markets for food supply may impact FSN and what role do informal markets play? How are urban areas reshaping agricultural value chains? What changes are needed in food systems and urban planning in order to improve the four FSN dimensions (availability, access, utilization and stability) for urban populations, in particular for the most vulnerable? What could be the contribution of urban agriculture to food availability and livelihood improvement?
- What changes are needed in urban dietary patterns and food environments to cope with new lifestyles and consumption habits with the perspective of improving FSN and human health?
- How to address structural changes in the economy and accompany the rural–urban linkages and migration of many of the rural poor? How trends affecting land tenure influence patterns of migration to cities? How to strengthen the vitality and resilience of rural areas to prevent social, political and ecological crisis? How to deal with the competition for natural resources (in particular for land and water) between rural and urban areas? How to provide decent jobs and working conditions in order to attract youth to agriculture and food systems?

2.2. Conflicts, migrations and FSN

Thirty-five countries were affected by conflicts in 2016 (World Bank, 2016). These countries house 500 million people, more than half of whom are rural, occupy about 10 percent of global farmland, and generate less than 1 percent of global GDP. However, Koren and Bagozzi (2016a, b) estimate that, with the spillover effect of conflicts on neighbouring countries, over 20 percent of the world's population lived in direct proximity to conflict between 1991 and 2008, the countries thus affected representing over 6 percent of global GDP. Furthermore, Breisinger *et al*. (2015) provide a figure of 46 percent of the developing world's population living in countries affected by civil conflict.

Disasters caused by natural hazards affected more than 2 billion people and killed more than 1 million globally over the period 2003–2013, causing USD1.5 trillion in damages globally over that period. The impact on developing countries was estimated at approximately USD550 billion (FAO, 2015a, citing EM-DAT CRED).

The combination of conflicts, shocks and crises is one of the main drivers of international migration and internal displacement (Zurayk, 2014; Breisinger *et al.,* 2015). As a result, the number of migrants worldwide has continued to grow rapidly over the past 15 years, reaching 244 million in 2015 from 173 million in 2000, while the number of refugees (living outside their country of origin) in the world was estimated at 19.5 million in 2014 (UNDESA, 2016). The number of internal migrants (within a country) is more difficult to evaluate but was estimated to be 763 million in 2005 (UNDESA, 2013a).

It is commonly assumed that food production ceases in countries experiencing conflicts and crises. Experience and research show that even in the middle of war, food production and trade can continue. Wars are often limited in time and space and a relative peace can prevail in certain areas while others are the theatre of combat. While food production suffers where there is war, trade between relatively calm regions and war zones can provide relief and facilitate food aid procurement. Recent research and reports show that, in 2015, wheat production in the Syrian Arab Republic was 50 to 60 percent of its long-term average and that the internal and external trade in foodstuffs is still active (Jaafar and Woertz, 2016). Yet, food security indicators show a dramatic decline among the most vulnerable populations.

In order to design appropriate recommendations, a systematic study of food security and nutrition in a context of conflict and crises could address the following questions:

- How do food systems operate in times of conflict? And, in particular, what are the sources of inputs and how do they reach the farmer? How are the crops sold? Who

buys them? Who produces food? What is the role of women in this process, especially if men are absent? What are the roles of government and other actors?

- What are the FSN consequences and how do we evaluate FSN in times of conflicts and crises? What role, for example, for remote sensing, which may help provide estimates of levels of supply, but not of levels of effective demand? How might we integrate crucial individual-level socio-economic variables, relevant to understanding food security, with national-level data? These include, but are not limited to, variables measuring consumption, diet diversification and malnutrition.
- How could we improve the design of relevant measures to address the impact of crises? What North–South and South–South partnerships are for example needed to develop the knowledge base for understanding the dynamics of food security in conflicts and crises and how do the key protagonists transform this knowledge into action? How can food security and nutrition systems be designed that will be not only sustainable in peaceful times, but also resilient during conflicts and crises? What is the role of international institutions, especially, but not exclusively, UN relief that is central to the crises and emergencies response system? How successful has cash-based assistance been in the humanitarian and food assistance infrastructure, especially in situations where markets are non-functioning? How do we address donor fatigue and public lack of attention at a time when information technology and globally connected networks provide insight into crises in real time?

2.3. Inequalities, vulnerability, marginalized groups and FSN (reviewing C&EI in 2014)

Social and economic inequalities were one of the main causes of the so-called "hunger riots" in 2008 (HLPE, 2011). This issue, identified in the first HLPE C&EI note (HLPE, 2014a), continues to be critical. Inequalities are pointed out as a major concern by many organizations (OECD, 2011; WEF, 2013; IMF, 2014; Oxfam, 2014). Since then, evidence shows the increasing risks to food security can be linked to high level of corporate concentration in food trade, transformation and distribution (Hendrickson, 2014; HLPE, 2016). Unequal endowments in agricultural assets and access to natural resources on the one hand (De Schutter, 2011) and to income on the other hand remain complex and multifaceted major concerns for FSN.

These inequalities impact on the governance of food systems and on unequal access to food; they raise more broadly ethical, economic (IMF, 2014), social and environmental concerns. Unequal access to food is in turn a driver of many other inequalities and instability: sustained disparities between vulnerable and other social groups can slow growth and lead to political unrest (Stiglitz, 2012) and to low levels of investment in the provision of public goods and services (UNDESA, 2013b). The resulting social tensions, migration fluxes and political instability continue to affect many countries.

The increasing awareness that inequalities should be looked at as a serious handicap for social cohesion, economic transformation and political stability (Piketty, 2014) is generating an international mobilization, reflected in the title of the 2030 Agenda: "No one left behind," and calls for the exploration of innovative pathways to diminish inequalities and thereby to enhance FSN. Investments for small-scale agriculture may be key to address most SDGs and the choice of development pathways can play a decisive role (HLPE, 2013; Sourisseau, 2015).

The issue of inequalities has been highlighted by many respondents to the 2016 consultation, with a focus on gender and youth. Empowering women and closing the gender gap, while providing decent employment to young rural people (Losch *et al*., 2012; World Bank, 2012) are seen as critical for sustainable food systems and improved FSN. According to FAO, closing the gender gap in agriculture would, for example, result in 150 million fewer hungry people (FAO, 2011).

The analysis and the consultation raise the following set of critical questions:

- How can the reduction of global, regional and national inequalities in income and in access to resources foster sustainable economic and social transformation and improve FSN? Which different pathways should be considered?
- How can the reduction of inequalities through sustainable food systems and better FSN contribute to conflict prevention, peace building and decrease in migration problems?
- How can gender mainstreaming approach and youth employment programmes in the agriculture sector and rural areas contribute to social justice and better FSN?

2.4. Impacts of trade on FSN

Trade in food is expanding rapidly but the expansion is not equal across regions or commodities (FAO, 2015b). Global agricultural exports nearly tripled in value between 2000 and 2012 (FAO, 2015b). FAO and OECD predict over 95 percent of the consumption growth in food between now and 2024 will occur in the global South (OECD/FAO, 2015). This expansion of international trade includes its rising importance in the distribution of staple foods. Where today one in six people in the world is estimated to obtain their staple calories from international trade, by 2050 that figure could rise as high as one in two (Fader *et al.,* 2013). Trade affects all four pillars of FSN in a complex way, both positively and negatively (Murphy, 2015). Moreover, trade policies interact with other powerful drivers, especially technology and demographic trends, which shape food production, distribution and consumption and compound the dynamic nature of the challenges. This complexity coupled with the rapid pace of change makes it difficult for policy-makers to address FSN as they agree, revise and implement multilateral trade rules.

The member states of the World Trade Organization (WTO) have largely proved unable to revise or add to the rules that govern multilateral trade in agricultural commodities, with the notable exception of the 2015 decision to permanently eliminate export subsidies. This means many aspects of the existing rules are out of date (see, for example, Galtier, 2015, for a discussion of the need to update the method used to calculate domestic support to agriculture). In the meantime, a growing debate over the need to address rising inequality and the failure to properly ensure that the benefits of trade are widely shared (discussed, for example, in a recent report jointly published by the WTO, the World Bank and the International Monetary Fund [IMF]) has weakened public support for a trade liberalization agenda. Some countries have adopted food sovereignty policies that explicitly privilege local and domestic markets rather than international trade (Lambek *et al*., 2014).

Several regions face fragile food supply lines and weak agricultural risk management strategies, due to wars, piracy, changing and unpredictable weather and ageing infrastructure. International trade in most agricultural commodities is managed through a small number of vertically integrated firms (Murphy *et al.,* 2012). Most of the staple foods sold in international markets are primarily sourced from just a half dozen countries. The challenges of financialization, closely linked to trade and investment agreements, and linked to the problem of concentrated market power in commodity trading was noted in the first HLPE note on Critical and Emerging Issues (2014a). These challenges have yet to be addressed.

Thus, on the one hand cooperation on trade is more important than ever for FSN; yet, on the other, there is a decline in countries' willingness to trust their food security to international markets and in their willingness to cooperate in the agreement of international trade rules.

It is not simple to give policy advice for trade and FSN (FAO, 2015b). The role of international trade in the realization of FSN has been the source of long-standing controversies among governments, civil society organizations and academics. Many economists argue that the environmental and social concerns associated with freer trade are best addressed with domestic policies that do not distort trade (Diaz-Bonilla, 2015). Others encourage markets but

support market interventions as well (Timmer, 2015), while the food sovereignty movement argues that local markets are the priority (Windfuhr and Jonsén, 2005).

Looking ahead, these challenges raise the following questions:

- How can policy help markets better capture the "true costs of production", including externalities that have a long-term impact on FSN, such as carbon emissions, fresh water use, soil depletion, biodiversity loss?
- Existing trade rules have significantly limited the role of governments in food distribution (buying from farmers, storage or export enterprises). But private monopolies and oligopolies are common. How can competition be ensured while respecting the very different political objectives and legal capacities of different countries to make and enforce regulations?
- How to reconcile the competing and sometimes contradictory demands of international trade and local and subregional markets?
- What next steps would support governments in the identification of their relative strengths and weaknesses in international markets with a view to developing trade strategies that respect their food security and nutrition needs?
- How best to rebuild a common basis for multilateral negotiations in the context of trade for FSN?
- How might trade and investment rules address the increasing concentration in food and agricultural commodity markets?

2.5. Agroecology for FSN in a context of uncertainty and change

Though variously defined, agroecological approaches are gaining traction among scientific, agricultural and political communities (IAASTD, 2009; EU SCAR, 2012; IPES-Food, 2016; HLPE, 2016). The former UN Special Rapporteur on the Right to Food has contributed to put agroecology on the map of the international community and policy-makers (De Schutter, 2011). Regional meetings on agroecology were held in 2015 in Africa, Asia and Latin America, as part of the process initiated by FAO with the international symposium held in Rome in September 2014.

Agroecology is described simultaneously as a science, a set of practices and a social movement (Wezel and Soldat, 2009), oriented towards the sustainable management of agroecosytems (Altieri, 1995; Marten, 1988) and food systems (Gliessman, 2014). Agroecological solutions are presented by their promoters as viable and sustainable alternatives to "business as usual" farming and its capital- and energy-intensive technologies (Gliessman, 2014). By combining scientific and farmer's knowledge (Mendez *et al*., 2015), agroecology offers a pathway to sustainable agricultural development through improved resource efficiency and strengthened resilience of farming systems (HLPE, 2016).

Confronted by major environmental, economic and social challenges, policy-makers need to understand how to harness the contributions of innovative approaches such as agroecology. The principles of agroecology are well established, but how to put them into practice on a larger scale raises many questions. Hereunder are listed some of the critical issues that need to be further analysed to provide policy-makers and other stakeholders with guidance on how to realize the potential contribution of agroecology to food security and nutrition:

- To what extent can agroecological innovations improve resource efficiency, strengthen resilience, secure social equity/responsibility and create decent jobs, in particular for youth, in agriculture and food systems, at different scales, in a range of agroclimatic zones and contexts? What are the controversies and uncertainties in the science and practice of agroecology?
- What kinds of markets and regulations are required to support agroecological farming, remunerate farmers and strengthen local, regional, and national economies? How do trade rules, intellectual property rights on seeds and livestock, as well as food

and safety regulations impact on agroecological pathways to food and nutrition security?
- How to better integrate different knowledge systems in participatory processes to tailor agroecological innovations to unique and highly diverse local situations? What challenges does this participatory research create for national and international research and extension systems? What are the enabling policies, organizational changes, institutional arrangements and new professional practices required to scale up and promote agroecological solutions for sustainable agriculture and food systems?

2.6. Agrobiodiversity, genetic resources and modern breeding for FSN

Conservation of agrobiodiversity and genetic resources and their sustainable use are fundamental to improve resource efficiency of agricultural production for improved FSN. Agrobiodiversity is also essential to strengthen resilience of agroecosystems to shocks and changes, biotic and abiotic threats such as pests, diseases, climate change, droughts and other unexpected natural events. Diversity of varieties of crops, tubers, horticulture, livestock and poultry breeds and fish species, resulting from human and ecosystem interaction, also contributes to diet diversity, guarantees food security and better livelihood in the world. The commercial varieties have increased the quantity of mainly starchy staple foods (wheat, rice, potato, maize, etc.). This has affected human diets and the quality of nutrition, sometimes negatively (Wenefrida *et al.*, 2013).

At the same time, modern agricultural practices are reducing available agrobiodiversity while it is the most needed to address challenges. The world has at least 12 650 edible plant species, about 7 000 of which having been used to a significant extent by humans at some point in time (Kahane *et al.*, 2013). Thousands of plant species and livestock breeds have been raised throughout human history, for food, feed, fibre, shelter and fuel. Since the 1900s, some 75 percent of plant genetic diversity has been lost as farmers worldwide have discarded their multiple local varieties and landraces for genetically uniform, high-yielding varieties. Today, about 30 crops provide 95 percent of human food energy needs and 75 percent of global food production is based on 12 commercial crops and five animal species (Howard, 2013; FAO, 1999).

The consequences of the gradual erosion of the rich biodiversity of plant varieties and animal breeds need to be better assessed, in particular for the inhabitants of threatened ecosystems, such as deserts, mountains, forests, coastal belts, wetlands and arid regions. Mapping and assessing agrobiodiversity within and between ecosystems (Cruz-Garcia *et al.*, 2016), and better understanding their role for sustainable agricultural production could be a priority area for FSN. Conservation of agrobiodiversity and its sustainable utilization for breeding and for production raise the following set of critical questions:

- How should diversification of crop species address food quality, in particular micronutrients and multiple nutrient densities, to ensure FSN?
- How could indigenous peoples' and small farmer seed supply systems be strengthened for ensuring FSN, while respecting the sovereign rights of the communities? How could participatory breeding initiatives contribute to developing plants with unique properties for quality, taste and tolerance to stresses, and to organic farming and climate change-resilient varieties?
- How could protection of agrobiodiversity in ecosystems contribute to FSN?
- What global regulations and intensive investments are needed for monitoring and addressing the implications of modern breeding on food diversity, food chains, pollinators, intellectual property rights (IPRs) and collective rights, indigenous seeds, ecosystems and gene-flow? What are in particular the challenges in addressing the corporate concentration and the resulting control of agribusiness megamergers over plant genetic resources and the world's agricultural seed supply?

2.7. Food safety and emerging diseases

Contaminated food is responsible for a substantial number of illnesses and deaths and affects socio-economic development worldwide. According to the WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) (WHO, 2006, 2015; Havelaar *et al.,* 2015), 31 food-borne hazards caused 600 million food-borne illnesses and 420 000 deaths in 2010. However, it is likely that these are underestimates, given that most people suffering from diarrhoea do not consult a physician. Nevertheless, the estimated burden of food-borne disease is comparable with those of such major infectious diseases as HIV/AIDS, malaria and tuberculosis.

The most frequent causes of food-borne illness were diarrhoeal disease agents, including bacteria, viruses, parasites and toxins. About 40 percent of the food-borne disease burden is among children under five years old and the highest burden is among people who live in low-income regions, including much of Africa, Southeast Asia and Eastern Mediterranean subregions (WHO, 2015).

Therefore, ensuring the safety from infection and contamination of the food produced, traded and eaten demands international attention. Production of safe food is also key for economic development because low- and middle-income countries must comply with international food safety norms if they want to access the global market (Chan, 2014). The growth in global trade and in the number of steps in the production process raises important concerns regarding the spread of food-borne diseases.

An important public health concern related to food safety is antimicrobial resistance, which calls for prudent use of antimicrobials in human medicine and in agriculture, particularly animal husbandry and aquaculture.

There is a need for global, national and local actions to improve safety of food from farms to factories, street vendors and kitchens. Among the core problems are fragmentation of food safety authorities, unstable budgets and lack of evidence and awareness about the magnitude and causes of food-borne diseases at country level. Given the globalization of our food system, that crosses national borders, a food contamination in one country can affect the health of consumers on the other side of the planet.

Therefore, food safety requires international collaboration and coordination efforts among different sectors, particularly health, agriculture, trade, education, social protection and environment, as well as appropriate infrastructure including cold chains. This raises the following questions:

- What are the international and national initiatives that need to be strengthened and developed to address the risks of food-borne hazards, set international standards, including monitoring and operating global alert mechanisms, assess the relevance and safety of new food technologies, and support countries to build basic capacities?
- How to adapt and apply WHO's Five Keys to Safer Food[9] in diverse countries for designing tailor-made messages to their communities?
- Is a large-scale industrial agricultural model supplying global value chains more or less likely to result in greater food safety incidents? Likewise, are more localized food systems less or more affected by food safety concerns?

2.8. From technology promises towards knowledge for FSN

Technology development has been a major engine for agriculture transformation in the past and will be pivotal to address future FSN challenges (IAASTD, 2009). Innovation will require both the development of new knowledge and technologies and the application of existing ones (UN Millennium Project, 2005) through appropriate FSN-oriented arrangements. In any case,

[9] Published online. http://www.who.int/foodsafety/areas_work/food-hygiene/5keys/en/ (accessed 26 February 2017).

FSN implies that knowledge and technology be applied throughout entire food systems, from input suppliers to farmers, food processors and consumers. Innovation involves the fine-tuning and adaptation of existing knowledge and practices to specific conditions. Applied research is essential to avoid a blueprint or one-size-fits-all approach. Such research may benefit from big data systems pooling together basic information on soils, climate and weather, water, crop and animal varieties and genetics, as well as information on food processing and safety. Information systems, including price, will also be essential to design and implement integrated strategies that allow more efficient resource use, so that ecological, climate, social, economic and FSN targets are met.

New knowledge and technology development for FSN and appropriate innovation policies are needed to find solutions in view of changing circumstances (OECD, 2012; Padilla-Péreza and Gaudin, 2014) and needs and to allow keeping pace with scientific developments in adjacent fields. Expected structural changes in emerging and poor economies, for example, concern regarding the availability and mobilization of labour in rural areas (Losch *et al*., 2012), require unique and innovative types of mechanization. Modern techniques that improve resource efficiency, strengthen resilience and secure social equity/responsibility should contribute to FSN-oriented innovations. Examples include biofortification (Rao and Swaminathan, 2017), nanotechnologies, drones and sensors in mobile devices to allow precision farming, technologies to reduce greenhouse gas emissions, to capture CO_2, and to reduce and recycle losses and waste along the food chain, and transparency through sensors to document food composition and traceability. Along with the digital revolution, the most challenging cases are perhaps found in the rapidly evolving field of genomics or precision breeding (which may or may not lead to genetically modified organisms). A battle of patents is currently raging with little concern indeed for the needs of poor farmers and consumers and therefore for the FSN of the most affected.

Ultimately, the challenge is not only to design new relevant technology but also to fill the technology gap by strengthening availability, information, accessibility and adaptation, and, consequently, the capacity to effectively access and use existing technologies (Wyckoff, 2016). Within such a perspective, consumers must be involved in order to bridge the gaps between rural and urban environments, increase producers' and consumers' understanding of and respect for food production and processing and the knowledge systems that underpin them, and enhance sustainable and healthy behaviour.

Technology and innovation may also negatively affect livelihoods and the environment. The potential associated risks deserve attention, especially since one can observe an increasing mistrust in certain institutionalized forms of science and controversies about science outcomes (Millstone and van Zwanenberg, 2000). The development as well as the application of knowledge and technology towards FSN, considered a public asset, thus require active and long-term partnerships between knowledge institutions, community-based knowledge holders, government, the private sector and non-governmental organizations such as environmental and consumers' organizations. Management of intellectual property rights and collective rights, regulation and sharing of experiences between countries and other actors and stakeholders are a matter of explicit agreements in a multilateral context. This is most important in the rapidly evolving fields of genetics and big data.

Therefore, considering knowledge and technology as a cross-cutting issue, the importance of a renewed investment and of the associated risks and controversies raise the following questions:

- What kinds of knowledge and technologies are beneficial for FSN?
- Which processes, partnerships, regulations and institutions are needed to produce and implement FSN-oriented knowledge and technologies and to fill the gap between production and use?
- How to address technology related risks towards FSN through regulatory frameworks, including patenting, and strengthen trust in science?

- Which statistics and metrics, in particular at the national level, are needed to assess and stimulate FSN impacts of technology change?

2.9. Strengthening governance of food systems for an improved FSN

The agriculture sector has experienced an in-depth transformation during the twentieth century, which made it possible to feed an exponentially increasing global population. Whether we name it industrialization or green revolution, such a change has also impacted all food systems (HLPE, 2016), e.g. supermarket revolution, corporate concentration, changes in dietary patterns, emergence of the overweight and obesity burden, exponential increase of trade. The transformation of agriculture has had huge health, social and environmental consequences.

Moving beyond agricultural supply as the main entry point to address FSN and demographic transition as the main driver, the HLPE (2016) already noted the need for a radical transformation of food systems as a whole to improve FSN and achieve the Agenda 2030 by improving resource efficiency, strengthening resilience and securing social equity/ responsibility. The transformation needed is not just incremental and is certainly of the same magnitude as the one called the “green revolution”, although with a completely different set of challenges. Such a transformation would provide a powerful lever to address most of the SDGs and their respective targets, as well as the whole 2030 Agenda.

Such a transformation of food systems cannot be spontaneous and will rely on an improved governance, i.e. a better coordination across sectors and among stakeholders to provide global orientations with the objective to achieve sustainable development and improve FSN. As in the past, policies will play a critical role in such a process, as they provide the necessary local and national specific tools. The exploration of new governance frameworks and policies is needed to improve policy coherence. It could also contribute to address some specific issues such as: (i) the erosion of social and ecological diversity, which are important sources of resilience; (ii) the increasing concentration and power imbalance; and (iii) inconsistencies and lack of coherence across sectors and scales.

Governance and policies for FSN-oriented food systems should in particular: support the co-existence of different farming systems and trade organizations; implement a rights-based approach; and consider issues of technology patenting, sanitary norms, as well as mechanisms to prevent negative and reward positive environmental and social production footprints. The consultation and analysis raised the following set of critical questions:

- How to build upon local initiatives through territorial approaches to design suitable governance and policies that promote innovation through conducive institutional and technical environments? With such a perspective, how to assess and improve funding mechanisms and multistakeholder partnerships, as well as private and public norms?
- How to stimulate the inclusive and intersectoral functioning of FSN-oriented policies and institutions? How to better articulate food security governance and global economic governance?
- How to support the capacity of innovation to improve FSN and address sustainable development at scales beyond local transformation and to ensure consistency through the alignment of local, national and international institutional arrangements and regulatory frameworks and the promotion of intersectoral approaches?
- How to better integrate FSN concerns in global agreements and conventions? How to provide the political and institutional national and intergovernmental frameworks for addressing trade-offs impacting FSN, with particular focus on trade, environment concerns and conflicts?
- How to support FSN-specific institutions and their capacity to strengthen accountability and to enforce the right to adequate food?
- How to implement monitoring and evaluation systems to deliver FSN?

Concluding remarks

Since its reform, the Committee on World Food Security has already worked on many issues of critical and/or emerging importance for food security and nutrition. For 13 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 2014, as requested by the CFS, the HLPE produced a first note, identifying five main *"Critical and emerging issues for food security and nutrition".*[10] Several of them have been addressed as topics of HLPE reports since then.

In addition, a rapidly evolving context and a renewed global agenda, with the endorsement of the 2030 Agenda and its 17 SDGs, and of the Paris Agreement on climate change, provide further incentive for this exercise. In this second note, building on an inclusive and evidence-based process, the HLPE Steering Committee has identified nine additional critical and/or emerging issues of major importance for today's and tomorrow's world FSN.

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 activities.

Because of the uncertainty of ongoing trends and important associated risks and controversies, the HLPE considers in addition that an investment in evidence- and knowledge-based foresight would be relevant and instrumental to strengthen the capacity to cope with change and address future FSN-related complex challenges.

[10] See: http://www.fao.org/cfs/cfs-hlpe/critical-and-emerging-issues/cei-2014/en/

Summary of the main issues

1. *Anticipating the inter-connected future of urbanization and rural transformation*

Increased rural-urban interlinkages present multiple challenges and opportunities for achieving FSN. Cities can act as a powerful driver of change and innovation in both urban and rural areas. Among the main challenges for the future: How to feed huge cities? How to deal with the competition for natural resources (including water) between rural and urban areas? How to adapt our food systems to evolving food environments and consumer behaviours and lifestyles?

2. *Conflicts, migrations and FSN*

The combination of conflicts, natural disasters, shocks and crises is one of the main drivers of international migration and internal displacement. A systematic study could help build a better understanding of how the food systems operate in times and zones of conflicts and the consequences for FSN of millions of people affected and to suggest appropriate policy recommendations and strategies.

3. *Inequalities, vulnerability, marginalized groups and FSN (reviewing C&EI in 2014)*

Inequalities in income and access to resources is one of the main causes of food insecurity and malnutrition. This issue, already identified in the first HLPE C&EI note, continues to be critical and should be rephrased in an evolving context. What are the possible ways to reduce those inequalities in order to progress towards sustainable development, improved FSN and to contribute to build peace and to address the challenges of conflicts and migration?

4. *Impacts of trade on FSN*

Local and global trade affect all four pillars of FSN, both positively and negatively. The role of international trade in the realization of food security and nutrition has been the source of long-standing controversies among governments, civil society organizations and academics. This issue could be explored in more depth in order to build, within CFS, a common understanding of the complex relationships between trade and FSN.

5. *Agroecology for FSN in a context of uncertainty and change*

Agroecology is described simultaneously as a science, a set of practices and a social movement oriented towards the sustainable management of agriculture and food systems. To what extent and at what conditions can agroecological innovations contribute to improve resource efficiency, strengthen resilience, and secure social equity/responsibility in agriculture and food systems? How to better integrate different knowledge systems in participatory processes to tailor agroecological innovations to unique and highly diverse local situations?

6. *Agrobiodiversity, genetic resources and modern breeding for FSN*

Conservation of agrobiodiversity and genetic resources and their sustainable use is fundamental to improve resource efficiency and strengthen resilience of agro-ecosystems to shocks and changes. To address this challenge, innovative institutional, legal and technical solutions, adapted to local contexts, taking into consideration traditional knowledge, need to be strengthened and developed.

7. *Food safety and emerging diseases*

Food safety, food-borne diseases, and antimicrobial resistance are emerging challenges for the next decades, at the global level. A better understanding of the impacts of different food systems on food safety and food-borne diseases, elaborating on WHO's Five Keys to Safer Food, could lead to recommendations and strategies adapted to different contexts.

8. *From technology promises towards knowledge for FSN*

Science, technology and innovation (STI) are key to improve resource efficiency and strengthen resilience of agricultural and food systems. However, the challenge here is not only how to develop new adapted technologies, but also how to make them adapted and accessible, including for small scale producers and for the most food insecure people, through appropriate innovative practices and institutional arrangements.

9. *Strengthening governance of food systems for an improved FSN*

Agriculture and food systems will need a radical transformation in the future decades. This will require an improved governance. Among the key challenges: how to better articulate governance systems at different scales and across different sectors in the overall framework of the 2030 Agenda and in the perspective of the progressive realization of the right to adequate food?

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