



DATA COLLECTION AND ANALYSIS TOOLS FOR FOOD SECURITY AND NUTRITION

Towards enhancing effective, inclusive,
evidence-informed, decision making

FOREWORD

The High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) is the science-policy interface of the Committee on World Food Security (CFS), the foremost inclusive and evidence-based international and intergovernmental platform for food security and nutrition (FSN). The HLPE-FSN provides independent, comprehensive and evidence-based analysis and advice at the request of the CFS and elaborates studies through a scientific, transparent and inclusive process, ensuring legitimacy among stakeholders, involving broad consultations and incorporating different forms of knowledge and expertise as well as a rigorous scientific peer-review process.

The report “Data collection and analysis tools for food security and nutrition: towards enhancing effective, inclusive, evidence-informed, decision making” has been produced by the HLPE-FSN following a request from the CFS and focuses on the role that data collection and analysis tools play in supporting effective evidence-informed decisions.

Food is a fundamental human right, and yet, too many people in the world do not have secure access to the food they need every day. In 2021, about one in every 11 people in the world (around 800 million people) faced hunger and many more (around 2.3 billion) were moderately or severely food insecure. The world is off track to achieving the SDG targets on hunger, food insecurity and malnutrition. Different and better actions are needed to reverse this trend.

Against this backdrop, **the findings and recommendations of this report are an important contribution to achieve food security and nutrition.** High-quality data

and its accurate and timely analysis are essential to design, monitor and evaluate effective FSN policies. Data is also fundamental to ensure accountability of government policies and to monitor their implementation and impact.

We are also experiencing a data revolution, driven by new technologies, which is increasing exponentially the volume and types of data available. This provides **great opportunities** for informing and transforming food systems, but also creates **new risks** and can deepen inequalities within or between nations and societies.

A major challenge in the elaboration of this report has been the **inherent complexity** of the different angles and multiple dimensions of data collection, analysis and use – including economic, social, institutional, political, legal and technical – as well as the types of users involved, namely public and private, and the numerous and diverse purposes data may be used for.

To **determine the scope of the report**, the HLPE-FSN took into account the following elements: 1) the points explicitly made by the CFS in their request; 2) the results of the e-consultation on the scope of the report; and 3) the conclusions of the meeting organized by the CFS Secretariat on the matter.

Addressing some points of the CFS request has been particularly challenging, due to scarcity of information regarding some issues and to the fact that data gaps are country-specific and cannot be described at a global level. Therefore, this report indicates directions for future research and suggests policy measures to improve this in the future.

Moreover, many of the identified issues are not specific for FSN data but apply to all types of data. Therefore, it was necessary to seek an **an appropriate balance between dealing with general data considerations and specific considerations related to FSN data**, in order to avoid duplication and overlap with other international reports on data.

Well aware of the complexity of this report and its relevance for improving FSN, the HLPE-FSN strived to apply **maximum precision, rigour and professionalism**, working at all times with evidence and academic references and providing sound and balanced arguments and conclusions regarding controversial issues.

The result is a set of **practical recommendations** addressed to the CFS, governments, the United Nations and international agencies, as well as academia.

It is imperative to achieve the necessary transformation of food systems and to embrace the data revolution in support of this effort. Decisive action now, leveraging current political opportunities and public opinion sensitivity and awareness, as well as technological innovation, can steer the course in the right direction. The CFS and its members can take great advantage of this report and its actionable recommendations.

On behalf of the HLPE-FSN Steering Committee, I would like to commend and thank the international experts of the project team led by Carlo Cafiero. They provided impressive work, solely on a pro bono basis.

The report also benefited greatly from suggestions by a large number of experts and institutions who commented extensively on the scope of the report and on its first version. Furthermore, I would like to pay my tribute the peer reviewers for their hard work. Finally, I want to thank the HLPE-FSN Secretariat for its precious support to our work.

The HLPE-FSN has a very noble and important mission, to produce **scientific reports**, which are **public goods** and serve as starting points for debates at CFS, between actors having many different perspectives and, often, objectives. This report can make a real difference on the ground and produce significant changes to alleviate the perils of hunger and help improve nutrition. I hope that policymakers, practitioners, all the actors around food, agriculture and nutrition and all concerned sectors worldwide will make the best use of it.

KEY MESSAGES

- Throughout the world, high-quality, timely and relevant data are key to inform actions that promote better access to food and improved nutrition.
- Despite the abundant and growing availability of data and information relevant to food security and nutrition, often policymakers are not aware of the existence and relevance of such data or do not use them appropriately, due to challenges at each step of the data cycle, which includes: defining priorities and data needs; reviewing, consolidating, collecting and curating data; analyzing the data using appropriate tools; translating data into relevant insights to be disseminated and discussed; and, finally, using data for decision-making.
- Fundamental data gaps still exist to correctly guide action and inform policymaking, especially in terms of timely and sufficiently granular data on people's ability to locally produce and access food, on their actual food and nutrient consumption, and on their nutritional status. Increased and sustained financial investment is needed to overcome these gaps.
- Several other constraints limit the effectiveness of data-informed policy action, especially in low-resource countries. Key among them is the low level of data literacy and analysis skills (for both qualitative and quantitative data) on the part of data and information users at all levels – from data collectors and analysts, to decision-makers, and to the people, as the ultimate beneficiaries of food security and nutrition policies.
- The complexity of the system of public and private actors and institutions involved in food security and nutrition data, coupled with the rapidly changing characteristics of today's data ecosystems due to the digital revolution and the pervasiveness of the internet, brings to centre stage the need for global coordination to improve data governance. Particularly urgent is the need to reach agreement on the nature of FSN data and information as a public good, and, on that basis, to establish a global legal framework that allows for the broadest possible circulation of relevant information, while preserving the rights of the people to whom the data ultimately belongs.

INTRODUCTION

When the UN Secretary General, Antonio Guterres, opened the UN Food Systems Summit, on 23 September 2021, he described current food systems as “failing”.¹ Even before COVID-19 made its unsettling appearance in late 2019 and before the aggression of the Russian Federation against Ukraine, lack of sufficient progress towards the targets of Sustainable Development Goal 2 (SDG2)² had made it clear that existing food systems worldwide had been unable to ensure food security and adequate nutrition for all, and that significant transformations were needed to correct this situation. Few can doubt the extent of persistent hunger, food insecurity and widespread malnutrition in all its forms in the world today (FAO *et al.*, 2017; 2022). Yet, evidence to highlight the nuanced scope of such failure and approaches to address food system solutions are still lacking.

The actions of public and private agents involved in managing and operating food systems, from production to distribution and consumption, are crucially affected by the extent of data and information they have access to. Despite the rapidly growing amount of data and information available today, this report outlines how its *timeliness, reliability, relevance, depth of analysis, and extent and clarity*

1 See <https://www.un.org/en/food-systems-summit/news/un-secretary-generals-remarks-food-systems-summit> and <https://www.youtube.com/watch?v=58t0l6-Sa0A>.

2 The second goal of the 2030 Agenda for Sustainable Development (commonly referred to as the SDGs) reads: “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”. It includes five targets in terms of outcomes and three targets regarding means of implementation. Target 2.1 reads: “By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round”, while Target 2.2 reads: “By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons”. See <https://sdgs.un.org/goals> for a full description of the SDGs, targets and indicators.

of communication require improvement to more effectively guide strategic policymaking in agriculture, food security and nutrition (FSN).³

This report, produced in response to a request from the Committee on World Food Security (CFS), focuses on the role that **data collection and analysis tools** play in supporting effective, evidence-informed decision-making by public and private agents. It covers the points explicitly made by the CFS⁴ and proposes solutions to support actions intended to reverse the negative trends in food insecurity and malnutrition, which have been linked to political and social instability (FAO *et al.*, 2017), the effects of climate change (FAO *et al.*, 2018) and economic slowdowns (FAO *et al.*, 2019), and which have been exacerbated by the lingering effects of the COVID-19 pandemic and by the Russian Federation–Ukraine conflict.

The CFS has stated the rationale for this report as follows:

Although it is widely recognized that sound decisions are based on good information and data, in many countries, particularly low and lower middle-income countries, timely and reliable rural, agricultural and food security statistics are largely lacking. Despite all efforts, most countries still do not conduct regular household and farm surveys, do not meet the minimum data requirements, lack sustainable data systems, and have insufficient capacity to analyse and use the data at their disposal. (CFS 2019/46/7, 2019, p. 8).

Therefore, **while many may live in places where data and information flow with unprecedented mass and speed, many countries still lack sustainable data systems and related capacities**. Rather than recommending from the onset additional investment in data collection for food security and nutrition, we first

3 Throughout the report, the term *agriculture* refers to the broader set of activities that involve the use of natural resources (land, water, forests, fish) to produce foods.

4 Namely, to:

- Highlight the benefits of using data and the opportunity costs of not using data for decisions
- Illustrate initiatives that have encouraged evidence-based decisions in agriculture and food security across the public, private, and academic sectors as well as approaches that have not worked.
- Identify specific high priority gaps in data production and analysis not covered by ongoing initiatives.
- Identify the barriers impeding quality data collection, analysis, and use in decision-making.
- Provide insights into how to ensure data collection and its utilization give voice to the people most affected by policies stemming from that data, including farmers and other food producers (CFS 2019/46/7, 2019, p. 9).

See CFS's Multi-Year Programme of Work at <https://www.fao.org/3/na703en/na703en.pdf>.

propose in-depth ways of thinking about data collection and analysis tools **to ensure full and proper use and re-use of existing data.**

The CFS presented the following additional rationale for this report:

Addressing the gap in quality data is also essential to monitor progress and understand where the world stands in achieving its shared goals – the SDGs. Custodian UN specialized agencies were identified for each SDG indicator to ensure that robust, global statistics were provided to measure progress in achieving the 2030 Agenda. However, the success of the SDGs rests largely upon strengthening data collection and statistical capacity-development at national level, including capacity building that strengthens coordination among national statistics offices (CFS 2019/46/7, 2019, p. 8).

As of this writing, there are still many countries in the world where training is required so that there are sufficient human resources to properly interpret, process and digest new data in the various forms in which it is continuously generated, stored and distributed. Of particular concern is that **this is true also for the scientific community**, where the more traditional research tools are being challenged by emerging ones,⁵ which have not yet sufficiently permeated academic curricula. This brings to the fore **the need to invest in capacity development at all levels, starting even in primary school and continuing through specialized training of professionals working in public and private institutions dealing with data.**

⁵ This will be discussed more in later sections of the report, but consider for example developments in the theory of measurement that address the problem of quantification in behavioural and social sciences (Bond, Yan and Heene, 2020; Mari *et al.*, 2017), or the epistemological implications of big data for research (Kitchin, 2014b).

SUMMARY

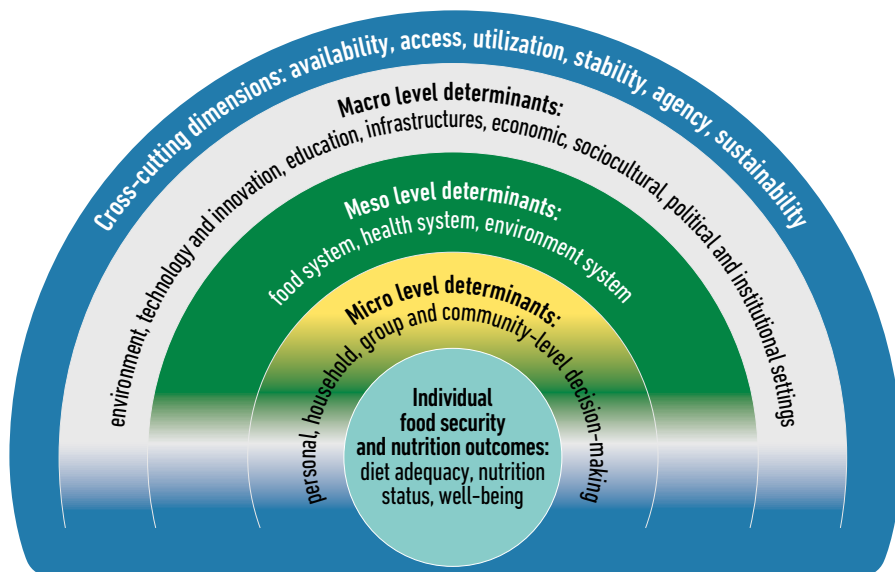
This report has been designed to respond to the call of the CFS to Support the process of laying the groundwork for informed decision making, setting standards for improved data-driven policies around food security and nutrition, and strengthening effective monitoring, review and follow-up to deliver SDG 2. (CFS 2019/46/7, 2019, p. 8).

To begin laying this groundwork, the report was developed with an understanding that food security and nutrition policymaking at global, national and local levels, involves **the use of data, either new or existing, to reach effective, evidence-informed decisions, and that this involves a distributed process**, where responsibilities are held by different individuals and institutions, at different levels.

The report is organized around six chapters: **Chapter 1** defines key concepts around the data collection and analysis tools that are presented throughout the report. It provides operational definitions of *data*, *analysis tools* and *data governance*, in an effort to avoid ambiguity in the interpretation of the concepts set forth. Chapter 1 also discusses data as public goods, an aspect that is important when considering improvements to capacity building, institutional arrangements and coordination, which in turn affect data governance arrangements. A conceptual framework (see Section 1.2 and Figure 1) is provided that draws on previous work by the HLPE and others (Bronfenbrenner, 1979; DFID, 1999; HLPE, 2017, 2020; UNICEF, 1990), linking food system policies and actions to the food security and nutritional status of individuals and the context in which they live.

FIGURE 1

FRAMEWORK FOR A SYSTEMIC VIEW OF FSN TO GUIDE DATA COLLECTION AND ANALYSIS

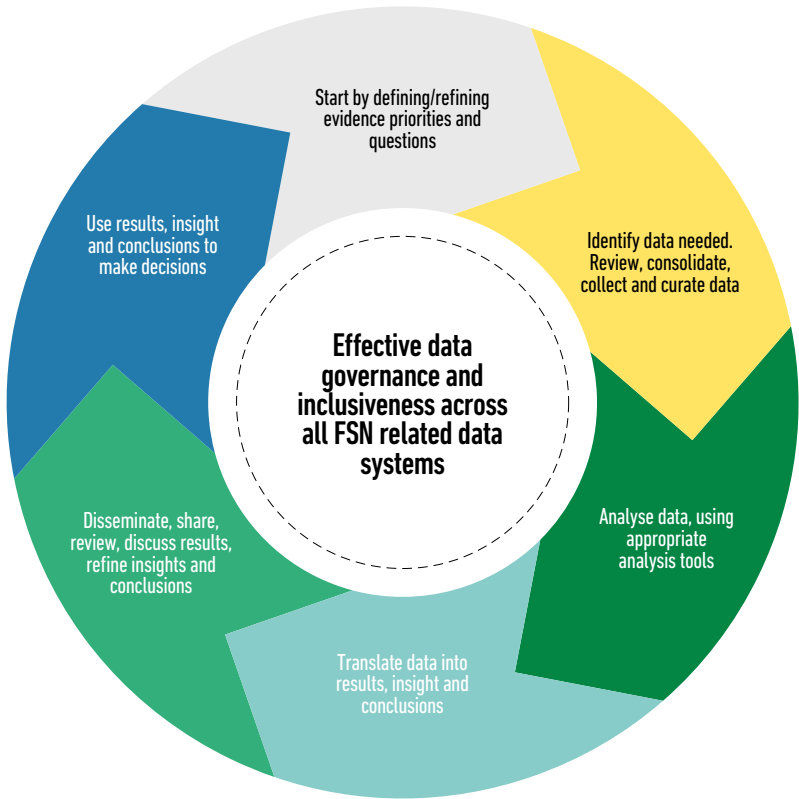


Source: Author's own elaboration, inspired by the HLPE Sustainable Food Systems Framework (HLPE, 2017; 2020), the UNICEF conceptual framework of the determinants of malnutrition (UNICEF, 1990; 2021), the socioecological model (Bronfenbrenner, 1979), and the Sustainable Livelihoods Framework (SLF)(DFID, 1999).

A key feature of the conceptual framework is the distinction in levels based on the proximity of the socioecological factors related to FSN (and corresponding decision-makers) to the individuals who are ultimately affected by FSN policies and actions. Furthermore, inspired by and adapted from the data cycle presented by Data for Decisions to Expand Nutrition Transformation (DataDENT, n.d), the conceptual framework identifies thematic areas for FSN data collection and analysis (see Section 1.3) and provides a schematic representation of the main steps to utilize FSN data for particular objectives. These six steps along a **cycle for data-informed decision-making** begin with identifying the priority question and continue through using the results, insights and conclusions (see Figure 2). Effective data governance

and inclusiveness are described in depth, as highlighted at the centre of Figure 2. This schematization complements the conceptual framework as it highlights how different actors use data to perform different functions while illustrating how myriad roles can coordinate efforts for FSN-related decision-making. Together, the conceptual framework and the data cycle help frame the discussion in the subsequent chapters of the report.

FIGURE 2
DATA-INFORMED DECISION-MAKING CYCLE



Source: Adapted from (Piwoz *et al.*, 2019).

The conceptual framework provides an effective way to **guide the selection and analysis in an organized manner**, by completing a matrix (Figure 3 in the main report), where each step in the data cycle is associated with the elements of the broad system, from distal (or macro), to individual outcomes.

Throughout the report, the conceptual framework and the data-informed decision-making cycle are used to highlight how data and analysis tools relate to each of the six dimensions of food security, as introduced by the HLPE-FSN (HLPE, 2020).

It is important to note that the report adopts **a broad definition of data** that includes all kinds of information – **both quantitative and qualitative** – that can be **codified, stored and transmitted in analogue or digital form**, and recognizes the risks and limitations associated with exclusive reliance on quantified variables in informing decisions.

Chapter 2 reviews existing data and analysis tools for FSN. It finds that, despite an abundance of FSN-relevant data at all levels, **there is a lack of broad, shared access to the disaggregated, granular data, at subnational and local levels, needed to inform action**, existing data could be better shared and analysed, by both public and private agents at national and international levels, in order to extract the wealth of useful information it contains. This will require a **rethinking of the way FSN data is governed**, especially considering the rapidly changing data ecosystem, described later in the report. The review of existing FSN data collection and analysis initiatives provides various examples of good practices that could be further enhanced and used in developing similar initiatives. The review also identifies the most important remaining data gaps and challenges at each step of the data cycle, such as: data on the characteristics of agricultural holdings, such as those produced by agricultural censuses; data on the different characteristics of farms and other operations across the agrifood system at the local level, as provided by farm and other industry surveys; data on household food expenditure; and, most importantly, data on individual dietary intakes. These kinds of data are essential to guide targeted FSN intervention, as they provide focused insights on local food systems and on the extent of inequalities within populations. While surveys and other sources of household- and individual-level data exist, the quality of the data they provide, and the frequency with which they are generated, are still largely insufficient to support effective decision-making, especially in low- and middle-income countries, and to conduct assessments during emergencies and in other difficult contexts.

The second part of Chapter 2 discusses current challenges and opportunities to improve data-informed FSN decision-making at each step of the data cycle. One finding is that **there is a general lack of clarity and coordination among decision-makers with regard to setting priorities when deciding on data collection and analysis**, and this stands in the way of filling in current data gaps. Better coordination in setting objectives for data use will contribute to creating an enabling environment, where institutions at various levels work together to gather, curate and disseminate data. This will be instrumental to favour increased access to existing data and to prevent the unnecessary proliferation of indicators, data-collection initiatives, and data quality assurance which result in fragmented data results that are difficult to reconcile and that are inadequate for informing effective action.

Of special note is **the importance of qualitative information for making decisions**. A myriad of personal, societal, cultural, religious and other considerations may have direct relevance for decision-making to improve FSN. Many of these aspects may be difficult or impossible to capture with quantitative data, and qualitative data are less amenable to collection by simple, standardized surveys, with the result that this type of information may end up being excluded from data consolidation and dissemination efforts. A final aspect involves communication and the importance of communicating data and the results of data analysis in a way that it is useful and effective for decision-making.

Chapter 3 discusses the major **constraints and bottlenecks** that underpin many of the gaps in FSN data collection and analysis identified in previous chapters, with a special focus on conditions prevailing in low- and middle-income countries. The constraints are grouped into two main categories: those related to insufficient resources – financial, human capital and data/research/analysis infrastructure; and those related to inadequate institutional arrangements, which lead to problems with data governance. **Timely allocation of sufficient financial resources, in a predictable way, is a key enabling element to sustain an effective FSN data ecosystem in any country**. Notwithstanding, this is a serious problem reported by many countries, where National Statistics Offices (NSOs) identify funding as one of their main constraints, in particular in the agriculture sector. Resource constraints continue to limit data collection in agriculture (where sound decision-making requires regular agricultural censuses and surveys of operations along the food supply chain), and in food security and nutrition outcomes (where up-to-date household surveys and

dietary intake information are needed). Although it is recognized that these are expensive initiatives, that demand adequate levels of human capacity, they are essential as they constitute the backbone of any FSN data system.

Chapter 3 also highlights the trade-offs between the financial and human resources needed to secure adequate generation of quality data: while the running costs of field operations, data storage and dissemination might be reduced by shifting from more traditional operations (as still conducted by many National Statistics Offices and other government statistics units in low-income countries) to modern data-generating technologies and digitalization, the process must be accompanied by upfront investments (infrastructure, machinery, etc.), but also by the **development of the necessary professional capacity**. Effective use of modern technologies for FSN data generation and analysis requires skills that are still in scarce supply. The lack of adequate investment in human capital, namely, expanding education on data science and statistics to all professionals involved in the FSN data-informed decision-making cycle, is the strongest binding constraint that prevents FSN data systems from developing in most low-income countries. Thus, it is the area where investments will certainly have the highest returns.

In terms of institutional arrangements, we note the **lack of coordination among the various agencies that are involved in generating and analysing FSN-relevant data**, which operate often under different administrative and logistic arrangements, for example, as units in different ministries (agriculture, health, economy, environment, etc.). This often results in costly duplication of efforts, leading to redundancy and, sometimes, inconsistency in the information generated by different units. This problem is not only present among government institutions at country level, but also in academia, and sometimes among international organizations, including within the UN System. The review leads to **a strong call for increased coordination at all levels**, from local, to national, to international, something to which we shall return to in chapters 5 and 6.

A discussion of data and analysis tools cannot be complete without recognizing that we are in the midst of a data revolution, including within agriculture and FSN. **Chapter 4** reviews how new and emerging technologies in digital data can contribute in many ways to FSN data and analysis, though perhaps requiring that the traditional ways of thinking about and regulating activities around FSN data

collection and analysis be challenged, including the roles and responsibilities of public and private actors.

Several examples demonstrate how each of these technologies can contribute to each phase of the cycle for data-informed decision-making, and how they may provide information that is relevant for each of the six dimensions of FSN. The review confirms that these **technologies have the potential to make a huge contribution, though their broad diffusion also comes with risks.** These include uncontrolled dissemination of digital data collected through devices embedded in machines (from tractors to personal phones), which can threaten privacy; problems of accountability arising from reliance on artificial intelligence, machine learning and other automated or semi-automated decision-making, which raises a number of ethical considerations regarding the use of these modern technologies; data quality and interoperability issues which may be conditioned by the specific technology used; and, finally, the very important **issues of equity, scalability and inclusiveness** that arise when considering the **differential capacity that exists both across countries and between public and private actors/institutions.**

Many of the issues raised and discussed in the previous chapters lead naturally to considerations around data governance, to which **Chapter 5** is devoted. The chapter begins by addressing two somewhat controversial, and strongly interlinked, issues around data governance. One is the debate on the nature of data: should data be considered public or private goods, and what role can markets play in this? Are market-based mechanisms able to guarantee an adequate supply of and access to data? The other issue is the question of data ownership and the social value of data. Especially when data contain personal information, who should own it? And if the data is considered to be owned by the people to whom the information is linked, should they have the right to sell it? With specific reference to FSN, there are convincing arguments that more disaggregated data is needed to better guide FSN interventions, but that such data might allow personal or group identification, in which case the data would be considered “personal data”. The question arises, then, as to whether current mechanisms for personal data protection, such as those based on informed consent, are sufficient to protect the rights of data owners, while ensuring that the information can be accessed to express its full potential for social benefits. One key suggestion in this report is that, from a moral standpoint, **personal data, like blood, is something that individuals may choose to give** when that is

necessary to obtain a personal service (for example, when blood is given for medical testing), but that people should also be encouraged to donate, when there is a clear indication that its use may contribute to a greater good (such as saving someone's life). What should be crystal clear is that **any resale of such data should be deemed immoral and even prosecuted as illegal.**

The main conclusion from the discussion in the first part of the chapter is that, because modern data that is recorded, stored and shared in digital forms, can be used and re-used, even simultaneously by many people, they must be conceived as inherently **public goods**. Access to such data should be restricted only when necessary to protect fundamental human rights, such the privacy of the people involved. For this purpose, innovative legal frameworks, such as those based on the concept of **data trusts**, defined by the Open Data Initiative as “legal structures that provide independent stewardship of some data for the benefit of a group of organizations or people” (Open Data Initiative, 2018), are a promising option for moving the data governance agenda forward, including in the agriculture sector and with regard to FSN data.

Fortunately, this is indeed a very active area of research and debate, and the chapter presents examples of existing initiatives, which may serve as models for yet more solutions.

Finally, **Chapter 6** summarizes the findings of the report and advances the recommendations.

RECOMMENDATIONS

One overarching conclusion from all the discussion in the report is that we live in a world where data and information are generated and flow with unprecedented volume and speed. Much more data and information potentially relevant for FSN is being generated today outside the traditional, official domains of data and statistics. As such, the number of actors who play an important role in this has increased substantially. Use of data and information to reach effective, evidence-informed decisions, involves a distributed process, including both public actors (such as national governments and international multilateral organizations in the UN System) and private actors (from large multinational corporations to small farmers and other actors in food value chains, to Non-Governmental Organizations and representatives of consumers and citizens throughout the world).

The recommendations set forth in this report constitute a call to action on the part of all these actors, which, if followed, may prove useful in moving towards more effective, evidence-informed decisions that will make food systems more sustainable and ensure food security and better nutrition for all, particularly for the billions of people throughout the world who still experience hunger and various forms of malnutrition.

Many of the messages in this report will not be new. The importance of data and evidence-based decision-making to transform food systems has been widely published and reviewed (World Bank, 2021). The 2014 Global Nutrition Report (GNR) called for a Nutrition Data Revolution [IFPRI, 2014], and many subsequent efforts have drawn attention to both the challenges and the emerging efforts to address them (see, for example, Piwoz *et al.*, 2019). Indeed, several of the challenges

across the data cycle were effectively highlighted, and solutions proposed, in the 2021 United Nations World Data Forum.⁶ Ample literature has also stressed the essential role of sustained investment in the financial and human capacity needed to accompany the data revolution.⁷

Despite this recognition and prior efforts, the generation and use of data for advancing FSN remains woefully inadequate. For example, while the effects of the COVID-19 pandemic have been modelled (FAO *et al.*, 2017; Headey *et al.*, 2020), we do not know its true impact on the affordability of food or on FSN outcomes due to the lack of up-to-date data. The continued effects on FSN of COVID-19 and of ongoing conflicts will also go insufficiently quantified and understood. These data gaps impede the development of effective policy and programmatic responses to address increasing hunger and malnutrition. Indeed, in the face of the failure of food systems and with less than a decade to go until 2030, the achievement of most of the SDGs is dependent on a radical and urgent transformation of food systems (HLPE, 2020). But resources and time are scarce, and there are many competing priorities and trade-offs to be considered. In light of these considerations, **data must be at the centre to diagnose and inform the food system transformations so urgently needed for FSN and for the planet.**

True progress towards enhanced data utilization for FSN will require bold, concerted action and the achievement of these five fundamental shifts in the way in which data and information are used:

1. CREATE GREATER DEMAND FOR DATA FOR DECISION-MAKING AMONG GOVERNMENTS, POLICYMAKERS AND DONORS

Demand for data for decision-making is a prerequisite for achieving more and better investments and more effective data utilization. But many political, economic and other considerations are brought to bear on policy and programmatic decisions, so that data may not always be a high priority. Data transparency and clear national

⁶ For more information, see <https://unstats.un.org/unsd/undataforum/blog/promoting-data-use-a-key-challenge-for-statisticians/>.

⁷ See for example this initiative from the Strategy for Agricultural Transformation in Africa 2016-2025: Invest in country level systems and data to support Climate-Smart Agriculture practices and agriculture sector resilience; develop the acquisition, application and management of big data for resilience decision tools and services; invest in country-level infrastructure and training for meeting CSA targets, monitoring GHG emissions and supporting innovation; support the design and development of agriculture climate risk tools and products. (African Development Bank, 2016, p. 20).

data strategies⁸ are vital to ensure that actionable data are available to policymakers when they need them, and in forms that facilitate their utilization. Another way to enhance data utilization is to illustrate the potential economic implications of *not* using data. Surprisingly however, few studies have quantified the economic cost to countries of policy and program measures that were not adequately informed by data. This must change.

Supporting demand for data can be facilitated by a framework for aligning and coordinating assistance from international organizations and donors.

To this effect, we recommend that:

- the UN System provide guidance that lays out **good practices for priority setting** guided by frameworks for data decision-making; and develop **practical guidelines on data-informed ex-ante and ex-post policy evaluation** in the FSN domain for national-level policymakers and administration;
- organizations in the UN System and national and international academic institutions **develop and promote the use of e-learning and continuing education courses in data prioritization and utilization for policymakers;**
- donors, supported by international organizations and academia, develop and use costing and cost-benefit analysis to assist policymakers to estimate the cost trade-offs of decision-making using data from varying sources; the World Bank, in its efforts to estimate the cost of nutrition-specific and nutrition-sensitive actions to achieve the SDG2 targets, also estimate the costs of decisions and actions that are not informed by up-to-date, accurate data on the FSN situation in countries, and estimate the savings that may be accrued by acting on better data;
- governments (via their ministries and agencies, including statistics offices) as well as private sector agents, international organizations and research institutions, **complete a data-informed decision-making process matrix for FSN (as set forth in Chapter 1 of the report) each time they are requested to address a specific challenge;**
- **for all FSN-related legislation and policy proposals, the responsible government authority include a detailed data annex**, presenting available data sources and the analytic tools intended to be used for their treatment;

To support the achievement of the SDGs, the United Nations Statistics Division (UNSD) is intensifying efforts to develop indicators and integrate geospatial and statistical data. However, not all countries have the same capability to establish food-data systems capable of collecting detailed, disaggregated data over time. Therefore, for these initiatives to succeed, efforts to modernize national statistics systems must be accompanied by assistance to countries with limited capabilities.

To this effect, we recommend that:

- organizations in the UN System develop **minimum standards that set clear criteria for optimizing the use of existing data** in the area covered in their respective mandate, streamlining the processes to be followed when using data for decision-making in FSN; and prioritize all types of remote and digital data and the development of appropriate data-management plans;
- governments, using such standards, **review existing national data-collection systems relevant for FSN**, with the aim of identifying opportunities to streamline and modernize them, and enhance their efficiency and relevance;
- academic institutions throughout the world coordinate to consolidate existing FSN data and **respond to the need for continued innovation in the areas of data science and survey-based research** to address FSN questions;
- efforts to modernize national statistics systems in order to establish comprehensive, coordinated FSN data systems and to sustain the collection of the disaggregated and detailed data needed over time, be accompanied by **technical and financial assistance to countries with limited capabilities**; To this aim, UN System organizations and donors consider establishing a **Global Food Security and Nutrition Data Trust Fund**, to which governments of eligible countries and other stakeholders interested in generating and benefiting from data (including, for example, communities and organizations of Indigenous People) can apply, in order to obtain the necessary financial resources to establish FSN data plans; conduct FSN assessment surveys for specific communities; and create and own data dissemination platforms;
- international organizations that produce key FSN data form a **joint commission to harmonize and coordinate the release of datasets**, avoiding the publication of competing datasets on important FSN domains (such as food commodity balances, food prices and market prospects, food security assessments, etc.);

- governments encourage empirical analysis of existing FSN microdata in administration, statistics institutes, agencies and universities; promote the hiring of statisticians, data scientists and experts in the analysis of qualitative FSN data; and **create an annual forum for data-informed discussion on national FSN policies.**

2. OPTIMIZE AND, IF NEEDED, REPURPOSE CURRENT DATA-RELATED INVESTMENTS, WHILE INCREASING COLLABORATION BETWEEN INTERNATIONAL ORGANIZATIONS, GOVERNMENTS, CIVIL SOCIETY, ACADEMIA AND THE PRIVATE SECTOR, TO HARMONIZE AND MAXIMIZE THE SHARING OF EXISTING FSN DATA

While additional investment in generating data is certainly needed, much can be accomplished through better use of existing data-related resources and by reinforcing the role of international organizations as producers of official FSN data as public goods.

The cost of surveys and all data collection efforts can be substantially reduced by being selective in what data to collect. It is therefore crucial to plan how data will be used *from the outset* to avoid collection of data whose purpose and utilization is unclear. Optimizing the data cycle for FSN is a key priority to reduce costs and enhance data-informed policy responses. The time from data collection to utilization can be decreased by developing analytical plans. Digital technologies and remote sensing hold enormous promise to reduce data collection costs, as does streamlined sampling. Finally, we must be open to change in technologies and processes for data collection, analysis and dissemination. As technologies advance, long-standing data collection systems must be adapted quickly and efficiently. In this respect, it is critical to harmonize data models and ontologies.

Although some initiatives are already in place to coordinate existing data collection activities and their governance, greater internal and international coordination is needed to avoid the proliferation of disconnected data initiatives, which can lead to costly duplication of efforts and contribute to sending conflicting signals. To the extent possible, initiatives should promote the use of data, including qualitative data, generated by the private sector, civil society and academia, in addition to official statistics, but these sources should never be intended to substitute national data systems. The main call should not be for more data, but, rather, for actions that will ensure that data generated are relevant, timely and useful.

- all these initiatives devote priority and specific attention to the **transfer of ownership of the used data and methodologies to the countries involved**, promoting the institutionalization of such data systems in national platforms.

3. INCREASE AND SUSTAIN INVESTMENT IN THE COLLECTION OF ESSENTIAL DATA FOR FSN

This report illustrates the multiple types of data essential to diagnosing and informing FSN actions. Data are woefully lacking in most countries for agriculture, food environments, household-level food access and dietary intake and nutrition outcomes. Often, most data exist only in the form of national-level statistics and indicators, providing few insights into subnational differences, inequalities across population groups, and other variations that may hold relevance for FSN. Increased and sustained investment in sufficiently disaggregated data collection is therefore urgently needed to fill these gaps, accompanied by clear standards to enhance the granularity of data and ensure that those most likely to be affected by inequalities are appropriately represented. Such investments must be accompanied by concurrent investment in capacity, structures and institutions to ensure effective data-related activities from prioritization through utilization.

To this effect, we make a strong plea to donors and governments for increased and sustained financial investment for the collection and consolidation of essential FSN data. Likewise, and recognizing the challenges in increasing investments, we recommend that:

- governments, especially those of low- and middle-income countries where FSN data gaps are particularly large, elaborate **national plans to define priorities for FSN data collection and analysis and to improve and optimize existing national data systems for FSN**. Countries that require support should be supported both technically and financially by international organizations and donors, and should follow international standards, while preserving country ownership;
- UN system agencies, in their respective areas of competence, develop **specific guidance for governments and national statistics offices to streamline data collection in order to prioritize the collection of actionable data**;
- donors; private entities in the information, communication and industrial technology sectors; civil society groups; and academic research institutions **invest in further refinement, validation and application of resource-saving data collection approaches**, such as remote sensing, natural resource scanning by

drones and digital data collection tools; tools and technology that streamline and simplify data collection (such as REDCap) be used and promoted at all levels;

- international organizations and academic research institutions **improve existing analytic models and develop new ones** to be employed in various areas of relevance for FSN decision-making, especially model-based approaches, in order **to forecast future values of FSN determinants and outcomes**, ensuring that such models are transparent and flexibly implemented so that they can generate predictions under clear, alternative scenarios (avoiding the use of black-box modelling).

4. INVEST IN HUMAN CAPITAL AND IN THE NEEDED INFRASTRUCTURES TO ENSURE THE SUSTAINABILITY OF DATA PROCESSING AND ANALYTIC CAPACITY

Investments specifically aimed at developing the human capital to collect, manage and analyse quality data, but also to synthesize and translate data into actionable insights for decision-making are urgently needed. Among other capacity gaps, we must address the differential between high- and low-income countries, and between the private and public sectors, in terms of ability to exploit the enormous potential that resides in existing data, accessible through the internet via increasingly affordable technology. Adequate data literacy is needed, especially among policymakers who rely on the results of sophisticated models for data analysis to make policy or investment decisions.

Promoting data literacy for the general population would also be a potent way to promote agency on the part of those whose FSN is at stake. Specific attention should be devoted to promoting sufficient minimum understanding of modern statistics and data science at all levels, for instance, by including these topics in school and academic curricula.

To this effect, we recommend that:

- **targeted scholarship programmes** be created by national governments – and adequately funded by donors – to allow young people from low-income countries, especially girls, to study science, technology, engineering and mathematics (STEM) disciplines;
- governments take action to expand primary and secondary education curricula to **include statistics and data science early in public education programmes**;
- national statistics offices offer **training opportunities to all staff**, of all ages, to enhance their competences in using open-source software for data analysis, and reward demonstrated achievement;

- UN System organizations and international research institutions contribute to eliminating language barriers, by expanding the set of languages in which relevant e-learning platforms are offered;
- international organizations, in collaboration with academic institutions, establish criteria for the quality of e-learning materials for data science and create a framework **providing objective quality assessment and ranking of existing, open-access on-line learning opportunities**, to identify the best, up-to-date courses and draw attention where quality improvement is needed;
- international organizations avoid crowding out local capacity, by making all efforts to **work closely with young professionals from national public institutions** whenever the need exists to analyse FSN data at national and subnational levels.

5. IMPROVE DATA GOVERNANCE AT ALL LEVELS, PROMOTING INCLUSIVENESS TO RECOGNIZE AND ENHANCE AGENCY AMONG DATA USERS AND DATA GENERATORS

With reference to data, agency refers to the ability to identify one's own data needs and to generate and use data to guide individual and collective decision-making in a two-way flow of data and information between the immediate and the distal levels. The inclusion of agency as one of the dimensions of FSN has important repercussions in the collection, analysis and use of data for FSN. It highlights, for example, how effective use of existing and new data will greatly benefit from concerted efforts to promote institutional and governance arrangements that favour data sharing at all levels and across all sectors involved in FSN, thus enhancing the agency of all those involved. We strongly subscribe to and support the call made by the 2021 World Development Report to work towards "a new social contract for data – one built on trust to produce value from data that are equitably distributed" (World Bank, 2021, p. 17). Thus, it is fundamental to enhance the role of data collection, analysis and utilization in giving voice to the people most affected by FSN policies, that is, to farmers and other food producers, to Indigenous Peoples, women, youth and vulnerable groups. A human-rights-based approach to FSN and to the realization of the right to food call for greater attention to citizens as right-holders and to their demand of accountability from the state as duty bearer in the realization of this right. Data can be an instrument of empowerment as it enables checks on the accountability of government actors and, as relevant, of the private sector.

Recognizing the importance of agency for data users and generators and enhancing agency require a conducive policy environment and capacity development. Enhancing agency in data generation and access (especially through digital technologies) can help address ethical concerns linked to power imbalances in data ownership and control, and can contribute to reducing inequalities.

To this effect, we recommend that:

- governments, international organizations, civil society, private companies and research institutions, both public and private, **comply with existing open-access principles for data and analysis tools**, ensuring access to and reproducibility of relevant research results, and continually adapt to enhance data access, as open-access principles and guidance evolve;
- all **government data that refer to agriculture and FSN be treated as “open by default”** as recently endorsed by the UN statistical commission;
- governments and multilateral organizations in the UN System work to **improve legal frameworks that protect sensitive data and privacy**, developing accountability systems for their implementation;
- FAO and other UN System organizations that have a mandate for agriculture, food and nutrition, develop **a code of conduct for data generation and use, based on FAIR and CARE principles**, that addresses the diversity of FSN data-governance-related issues – including power imbalances, inclusiveness, the operationalization of open access and transparency principles – for all types of actions in data generation, consolidation and utilization; and that **FAO become a FAIR and CARE certifier for agriculture, food and nutrition datasets**;
- CFS explore the possibility of establishing **one or more data trusts for food security and nutrition**, where a subgroup of CFS members can act as trustees, receiving the legal right to make decisions – such as who has access to specific data and for what purposes – on behalf of the data owners; and that such a data trust may constitute the legal basis to support the sharing of data collected with funds obtained through the global FSN data trust fund;
- CFS convene a **workshop to assess the state of private data sharing in agriculture, food security and nutrition** and consider exploring the possibility of piloting the aforementioned data trust for food security and nutrition;

- appropriate **collaborative data initiatives between governments, international organizations, civil society and private companies** in the information and communication industry should be put in place to guarantee access to all relevant, non-personal, food security and nutrition data generated and stored by private agents;
- upon justified request, **personal data collected and stored by private agents be mandatorily made accessible to governmental and intergovernmental organizations for research and policy-guidance purposes**, in a way that protects against misuse and violation of privacy and other individual rights;
- private and public sectors, together with all the previously mentioned actors, engage in analytical processes that incorporate the science–policy interface, through, for example, foresight analyses (e.g., Foresight4Food), DELPHI processes, or approaches that incorporate multiple analytical approaches to engage diverse stakeholders and policymakers (e.g. the INFORMAS approach for the study of food environments).

Food is a fundamental human right, yet too many people in the world do not have secure access to the food they need. High-quality data and their accurate analysis are essential to design, monitor and evaluate effective food security and nutrition (FSN) policies. Data are also fundamental to ensure accountability of government policies and to monitor their implementation and impact. The data revolution, driven by new technologies, is increasing exponentially the volume and types of data available. This provides great opportunities for informing and transforming food systems, but also presents new challenges which, if not properly tackled, can deepen inequalities. This report presents the inherent complexity and multiple dimensions of FSN data collection, analysis and use – including economic, social, institutional, political, legal and technical dimensions; the types of users involved and the numerous and diverse purposes for which data may be used in food security and nutrition efforts, as well as the extant challenges. The report also advances actionable recommendations to enhance the contribution that data can make to ensuring food security and nutrition for all.