Data collection and analysis tools for Food Security and Nutrition

towards enhancing effective, inclusive, evidence-informed decision making

HLPE-FSN Report #17

Presented by
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Outline of the presentation

- An introductory note
- The facts
- The challenges ahead
- Some details, including frameworks, challenges and examples
- Key messages, calls for action and detailed recommendations

An introductory note

we live in a rapidly changing world that is calling for a change in the way we look at data and information

An introductory note

- The conceiving and preparation of this report has taken place during a **special time**, during which we have witnessed the rapid sequencing of global, **historic events** like the COVID pandemic and the onset of a regional conflict, which together may end up having **global consequences for food security and nutrition** that are yet to be properly understood.
- This has posed additional important, **specific challenges** to the Team, which was already tasked with a quite challenging objective.
  - For example, we have **not been able to meet in person**, even once, as a team.
- Most importantly, some of the **important aspects** to be discussed where **evolving in significant ways** while we were trying to capture them in the report.

… … …

An introductory note

For example:

- Developments have been occurring in the **data governance** arena:
  - On January 1, 2020, a new data privacy law came into effect in California, the largest state in the US, whose wide-ranging data privacy regulations are largely modelled on those of the EU's GDPR and which are expected to have broad implications on data sharing in the US and elsewhere.
  - Along the same lines, China's Personal Information Protection Law (PIPL) went into effect on 1st November 2021, also largely inspired by the EU's GDPR.
  - FAO is reviewing and re-elaborating its Intellectual Property and Data Governance policies literally as we speak.
  - There is a continued mushrooming of initiatives mentioning **data collaboratives**, **data stewardship**, **data champions**, etc. which were simply too many and too recent for us to be able to properly review in the report presented today.

… … ..

An introductory note

Also:

- A growing attention is currently being given to **data in emergencies.**
  - Immediately after the aggression of the Russian Federation against Ukraine, concerns started to appear on what the **implications** of the conflict might be **on the world food security situation**, considering the relevance of the two actors involved on the world agriculture and food markets.
  - Once again, many initiatives have been created that try to improve on our collective ability to **assess the situation and anticipate its impact**, which have been impossible to reflect in the report.
    - On July 7, 2022, the new **FAO Data in Emergencies** (DIEM) information system was launched.
    - A new **Global Alliance for Food Security** (GAFS) was launched at the 2022 G7 summit in Germany, which is devoting special attention to FSN data and information systems.
- Rather than an apology for things readers may find missing in the report, I take this as a testimony to **how timely and important is the topic discussed** and a tribute to the foresightedness of those who selected it.

The facts

the basis for our reflections

Fact #1

Food security and nutrition outcomes are the results of decisions made at multiple levels in a complex system.

- Simplistic **views based on "linear" thinking** that imagine a one-directional link from causes to effect **are bound to fail** in recognizing the true nature of problems and identifying effective solutions (for example: food prices, cost and affordability of healthy diets).
- With reference to data and information, it implies that it is **impossible to make full sense** of existing pieces of data and information **by looking at them in isolation** (and any such attempt may end up being misleading).
- A consequence of all this is that **coordination** among the various stakeholders and decision makers **is key for success**, including with respect to data sharing and agreements on concepts and definitions.

Fact #2

There is already an incredible amount of data and information available, that are relevant for FSN, and more are being generated daily.

- Before rushing into even more data collection and information generation, it may be best to facilitate broader sharing of the existing ones.
- Such mass of data and information, however, often exceeds the capacity of decision makers to make proper, full sense of it.

Fact #3

Yet, there, are important areas where timeliness and granularity of the available information is insufficient to effectively guide FSN policy and action.

- Key, for example, is **reliable, timely information on food consumption and dietary intake** that can perhaps only be generated by well designed population surveys.
- Lacking such granular data, **a full understanding** of the links between individual's and households' difficulties in accessing food, their determinants (such as poverty, high food prices, limited local availability, etc.) and the nutritional outcomes (from undernutrition, to overweight, obesity and other diet related non communicable diseases) **remains elusive.**

Fact #4

New digital technologies and modern data analytic methods (i.e., based on machine learning and artificial intelligence) offer great opportunities – in part already being explored – but also present specific risks.

- Digital divide.
- Personal data protection.
- Unsupervised algorithmic decision making.

The challenges

Challenge #1

As already highlighted by the World Development Report in 2021, we need "a new social contract *that enables the use and reuse of data*" (World Bank, 2021).

- The rapidly evolving, but probably still inadequate ***global data governance systems***, may fail to address the many subtle economic and ethical aspects of the data revolution, associated with capture, ownership and sharing of both personal and non personal data on a global scale, often beyond the ability of any national government to control.
  - While heightened attention is being devoted to the issue of privacy and personal data protection, less attention is being devoted to the more fundamental issue of **data ownership:** still too often, data tend to be treated as any other private asset, as if they might be effectively managed by mechanisms designed for excludable goods and services, through contracts that stipulate the need and foresee the possibility to effective control access to the data.
- A new, much bolder, position ought to be taken, that recognizes the incredible potential of **digitized data that can be used and re-used** even simultaneously by many users and for different purposes.
  - **IP features** such as copyright, for example, **are obsolete**, and vastly insufficient to ensure an efficient use of existing modern data.

Challenge #2

How to ensure *effective coordination* among the many data generating and data user entities, both public and private, national and international, political and academic, remains problematic.

- One of the consequences of a vision of **data as an *asset*** owned by someone, is that investments in data generation and the management of existing data are guided by an expectation of **specific *returns* to the data owner.**
- As a results, many potentially **useful datasets tend to remain siloed**, not shared for fear that the potential private returns may be eroded.
- On the other hand, treating data as a real global public good may incur in the underinvestment problem typically associated with the ***free rider* problem**.

Challenge #3

Adequate, deep data and information *analytic capacity* is still largely unexploited (and often unavailable) at all levels of the data-informed decision-making cycle

- While highly fashionable these days, **big-data analytics** based on machine learning algorithms and artificial intelligence offer some solutions, but **cannot be considered a full substitute for** more traditional, sophisticated methods to distil information from limited data, based on **statistical inference**
- Sophisticated statistical inference methods still too often are not part of the toolkit of many applied food security and nutrition analysts, who use **quantitative models based on overly simplistic assumptions**.

- A common, yet misleading divide between “quantitative” and “qualitative” research methods in the social sciences must be overcome, recognizing the need to bring in scientific analyses and solutions for FSN the fundamental elements of an appreciation of ***residual uncertainty*** and of ***creativity.***

The structure of the report

a short guide to reading it

Six chapters

1. **Setting the stage**
   - Definitions and conceptual frameworks.
2. **A review of existing FSN data collection and analysis initiatives**
   - Illustrating good practices and the richness of what is already there.
3. **Constraints, bottlenecks (and some solutions) for effective use of FSN data**
   - Focusing on what is still lacking, especially in countries where resources are more limited.
4. **New and emerging digital technologies for FSN data**
   - Opportunities and risks associated with the diffusion of new data technologies.
5. **Institutions and governance for FSN data collection, analysis, and use**
   - Perhaps the key challenge.
6. **Final reflections and recommendations**
   - Presented to provoke further, in depth discussions.

The details

what to look for in the report

Definitions

In the report, we take a broad definition of data to include *"any set of codified symbols representing units of information regarding specific aspects of the world that can be captured or generated, recorded, stored, and transmitted in analogue or digital form."*

- We recognize the risks and limitations associated with an exclusive reliance on *quantified* variables in informing decisions.
- We recognize the enormous expansion in the ability to store and transmit data – including in the form of texts and visuals – brought about by the digital revolution.
- We stress the importance of proper *coding* (that is, the adherence to clear standards and definitions) to qualify recorded symbols, texts, sounds or images, as *data*.

Definitions

Similarly, we interpret the expression analysis tools as referring to *"any set of formal rules used to guide the processing of available data, aimed at obtaining analytic results for a specific purpose or research question."*

- This stresses the importance of formalizing the rules followed when processing data, and the specificity of the tool to the research question it aims at addressing.
- One important quality of analysis tools is their transparence: they should never be, or even simply appear as "black boxes", especially to those who will be called to action by the results of the analysis.

Definitions

Finally, we view data governance to be comprised of a "*globally relevant set of principles, strategies, policies, regulations and standards developed by institutions to collect, manage, share and use data*"

- The ultimate objective of all this should be to enable the broadest possible data sharing, so that data can be used and reused effectively by many analysts, while ensuring the protection, integrity and transparency of data systems

Frameworks

By adapting existing ones, we develop two conceptual frameworks in the report

- **A framework for a systemic view of FSN**
- **A data-informed decision-making cycle**

Then, we link them together and propose of a way to look at data and information for FSN decision making through

- **A data-informed, decision-making matrix**

A framework for a systemic view of FSN

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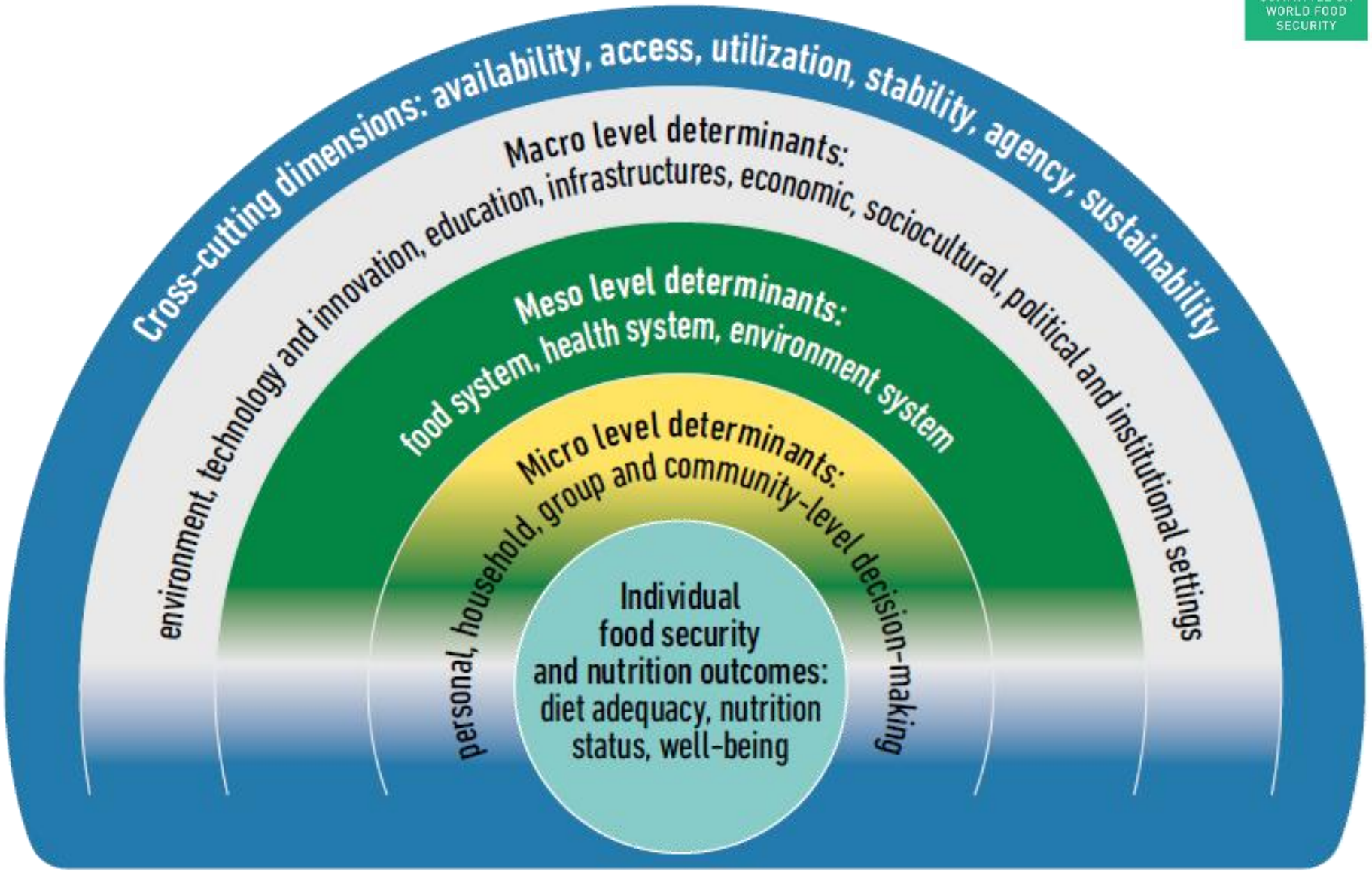
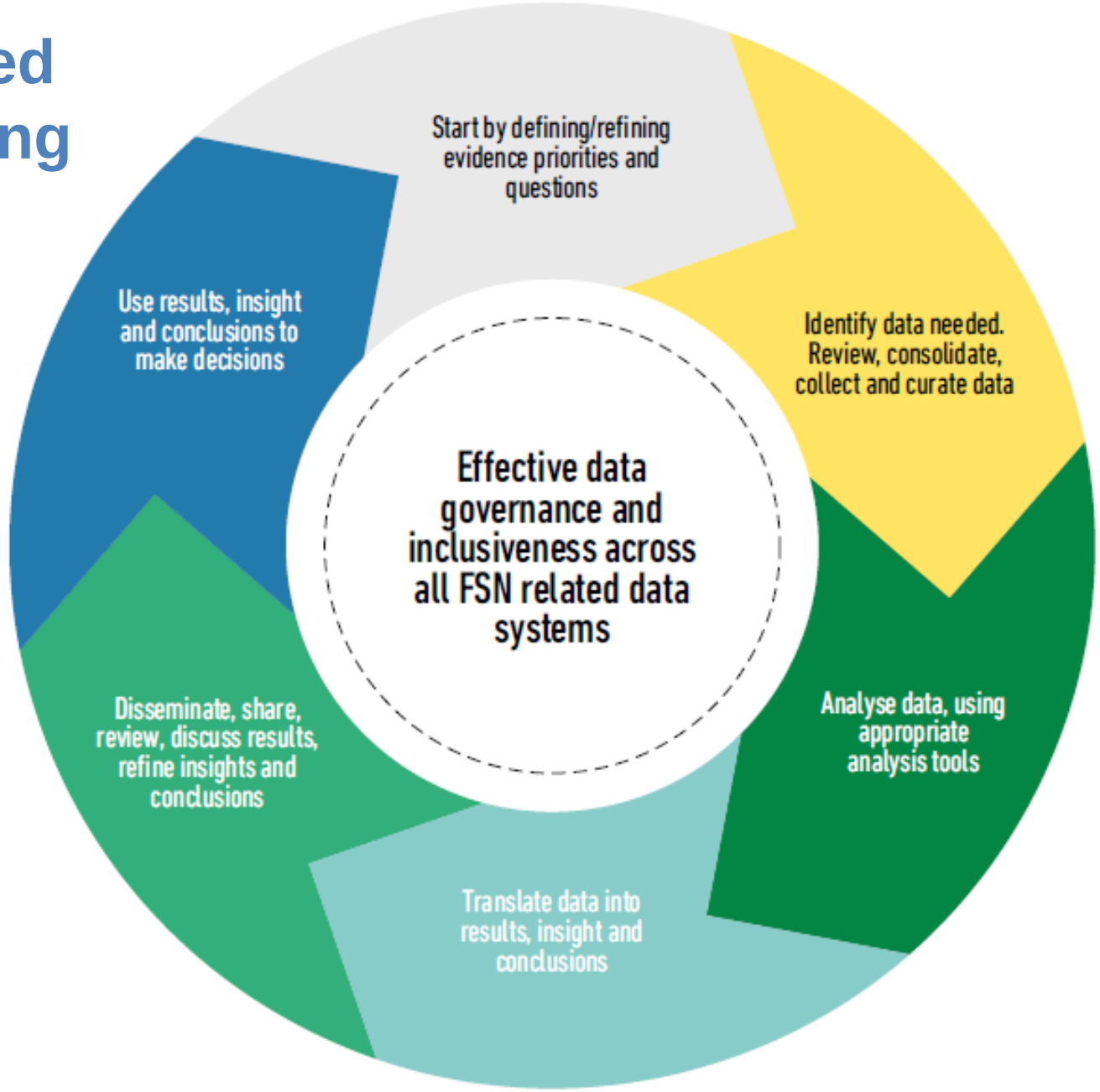


A data-informed decision-making cycle



Embedding the two frameworks in our own "analysis tool": the data-informed, decision-making matrix

Level	Data cycle phase				
	Review, consolidate, collect, curate data	Analyse data using appropriate analysis tools	Translate data into results, insights, and conclusions	Disseminate, share, review, discuss results; refine insights and conclusions	Use results, insights and conclusions to make decisions
Macro					
Meso					
Micro					
Individual outcomes					

Examples

- **The report discusses many examples, included in 33 Boxes, highlighting:**
  - Existing data sources
  - Good practices of data sharing and other data governance initiatives
  - Examples of FSN information systems
  - Specific technical problems
- **The selection is certainly not exhaustive, though we believe it is representative of the vast array of existing examples and issues**
  - We include an Annex Table that lists some of the most relevant data sources by relevant food security dimension and level in our conceptual system framework

Examples

Level	Dimensions of food security and nutrition					
	Availability	Stability	Sustainability	Access	Utilization	Agency
Macro	Natural resource base Earth Observation International food commodity stocks and trade	Global/regional food commodity stocks and reserves	Weather and other risk trends and predictions	International food commodity prices	Food composition data Food safety data	
Meso	Domestic food availability	National food stocks and reserves		National food price indices	Water & Sanitation	Market concentration shares
Micro	Local food systems	Early Warning Information Systems		Local food prices Household incomes and consumption patterns Food insecurity experiences	Household living conditions Household water access	Food insecurity assessment surveys Women's Empowerment in Agriculture Rural Livelihood and Information Systems
Individual (Outcomes)	Dietary intake/diet quality; malnutrition prevalence and related health outcomes					

The key messages
(and related proposals)

Key message #1

Despite the abundant and growing availability of data and information relevant to food security and nutrition, often decision makers are not aware of the existence, breadth, and relevance of such data, or do not use them appropriately, due to challenges at each step of the data cycle.

Calls for action

- Create (even) greater demand for data for decision-making among governments, policy makers and donors, by promoting a broader data and information analytic culture among decision makers at all levels.
- 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.

Key message #1 (cont.)

Specific recommendations

- Organizations in the UN System could lay 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 should 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, should develop and use costing and cost-benefit analysis to assist policymakers to **estimate the cost tradeoffs of decision-making using data from varying sources**.
- Governments, private sector agents, international organizations and research institutions, **complete a data-informed decision-making process matrix for FSN** 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** to be used for their treatment.

Key message #1 (cont.)

Specific recommendations (cont.)

- Organizations in the UN System may 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;
- 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.)

Key message #2

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.

Calls for action

- Increase and sustain investment in the collection of essential data for FSN.
- Promote 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. Such efforts are accompanied by technical and financial assistance to countries with limited capabilities.

Key message #2 (cont.)

Specific recommendations

- The UN System and donors may 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 to obtain necessary financial support to establish FSN data plans; conduct FSN assessment surveys for specific communities; create and own data dissemination platforms.
- Governments should 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**.
- 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**.

Key message #2 (cont.)

Specific recommendations (cont.)

- 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 relevant are **validated model-based approaches** to forecast future values of FSN determinants and outcomes,
  - Such models should be **transparent** and flexibly implemented so that they can generate predictions under clear, alternative scenarios, avoiding the use of black-box modelling.

Key message #3

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.

Call for action

- Invest in human capital and in the needed infrastructures to ensure the sustainability of data processing and analytic capacity.
- Develop the necessary foundations of data and information analytic capacity for all stakeholders involved, by investing both in human capital and in the needed infrastructures, to ensure the sustainability of data processing and analytic capacity

Key message #3 (cont.)

Specific recommendations

- 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;

Key message #3 (cont.)

Specific recommendations (cont.)

- 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 statistics and 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 the local, relatively scarce, 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.

Key message #4

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.

Call for action

- Improve data governance at all levels, promoting inclusiveness to recognize and enhance agency among data users and data generators
- Take bold actions in establishing a proper food security and nutrition data governance system at the global level

Key message #4 (cont.)

Specific recommendations

- 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.

Key message #4 (cont.)

Specific recommendations (cont.)

- 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.**
- The 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.
- The CFS might 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.

The Team

The team

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Thank you!