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ASSESSING NATIONAL AND SUBNATIONAL FOOD SYSTEMS IN LOW-INCOME AND LOWER-MIDDLE-INCOME COUNTRIES

A methodological framework

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Introduction

Food systems are linked to 12 of the 17 Sustainable Development Goals (SDGs), providing an important entry point for addressing issues of sustainability, resilience and inclusiveness (Chaudhary et al. 2018; UN Environment 2019). The challenge for food systems is to not only produce food and have a direct impact on food and nutrition security, but also to contribute to sustainable employment and livelihoods and to building a sustainable planet. Given these multiple food systems goals, their governance is critical.

Food systems involve relationships between a wide range of institutions, levels of government, diverse public, and private and civil society actors representing numerous sectors (e.g. agriculture, trade, industry, health, environment, infrastructure). In every country, region, district, city, town or village, food system actors face locally specific challenges, with varied sector impacts. Finding pragmatic solutions to specific problems in the food system at these levels not only requires a good understanding of the linkages between system components but also governance structures capable of addressing trade-offs between system outcomes and sustainability dimensions.

Despite food systems' multiple contributions to broader societal, environmental and socioeconomic goals, there is widespread recognition of increased risks affecting the overall unsustainable food systems (Béné, Oosterveer et al. 2019). These risks and challenges of sustainable food systems are particularly acute in low-income and lower-middle-income countries (Dury et al. 2019).

First, food insecurity and the triple burden of malnutrition[1] exist simultaneously. Since 2015, after decades of declining undernutrition, food insecurity has risen; the trend has recently reversed so that in 2020, more than 820 million people suffer from hunger (FAO 2019). Beyond persistent undernutrition, populations are increasingly suffering from micronutrient deficiencies, obesity and food-related chronic diseases (HLPE 2017; EAT-LANCET 2019).

Second, the productivity-oriented, agro-industrial production model has succeeded in producing cheap food (mostly in terms of calories, fat and proteins), but at a cost: accelerated depletion of natural resources, damaged ecosystems and threatened biodiversity in many parts of the world. The agriculture sector is a major producer of greenhouse gas (GHG) emissions. This dependence of this production model on natural resources (e.g. land, water, minerals, and biodiversity) also challenges its long-term sustainability (Westhoek et al. 2016).

Third, demographic and socio-economic trends are creating new challenges to food systems. Rapid population growth accelerates the demand for food in both urban and rural areas in low-income countries and lower-middle-income countries. In addition, rapid urbanization, urban lifestyles and evolving food

[1] Triple burden malnutrition covers undernutrition (underweight, stunting and wasting), overweight and obesity, and micronutrient deficiencies

consumption patterns are exerting a large influence on the food system, with urban areas representing 70 percent of global food demand (FAO 2017). Poverty, inequality and uneven access to productive resources are still predominant in many low-income and lower-middle-income countries. The capacity of many countries to meet their human development goals (with respect to poverty, education and health) depends largely on livelihoods and income opportunities, many of which are generated by the food system in production, industry and service sectors. These jobs are especially important in many African and Asian countries with large populations under 25 years of age. Food systems are crucial in contributing to inclusive economic development, creating (or preserving) jobs at all income levels, especially for the most vulnerable population groups dependent on informal food sector jobs and businesses.

Food systems are also vulnerable to diverse shocks, including agroclimatic, zoonotic and socio-economic ones. The COVID-19 crisis highlights the importance of resilient food systems to various disruptions that affect food security and socio-economic well-being. It also confirms the increasing importance and engagement of local leadership and government in finding solutions to food system problems that are adequately tailored to local contexts.

The development of a vision that accounts for human and environmental interactions (as advocated in socio-ecological systems) and the adoption of a comprehensive analytical framework and food system approach is therefore increasingly acknowledged as a way to deal with these key challenges.

This methodological framework presents a multidimensional view centred on four core food system goals:

1) Food security, nutrition and health: Ensure food security and provide healthy, balanced and nutritious diets, to contribute to health for all.

2) Socio-economy: Provide decent livelihoods and jobs for all food system actors, notably smallholders, women and youth, contributing to inclusive economic growth through the food sector (from production to distribution) and an improved food trade balance.

3) Territorial balance: Contribute to balanced power distribution and territorial development, fostering stability and equity among food systems actors.

4) Environment: Manage, preserve/regenerate ecosystems and natural resources and limit their effects on climate.

In section one, we present an analytical framework of a systemic view of food systems, their multidimensional nature, their core functions and actors. It also examines the larger environment and key drivers, well as their outcomes and long-term impacts on the key parts of sustainable food systems.

In section two, we describe a method designed to conduct a rapid food system analysis in low-income and lower-middle-income countries. The methodology provides a holistic analysis of food systems performance and its main drivers, including past trends and future projections on food system

sustainability. The section also examines the spatial distribution of the primary food system challenges and related causes and trends across the country. Section two presents the rapid methodology for the food systems analysis; the outline of a similar but more extended methodology is presented in Appendix 2.

In order to integrate the short- and long-term contributions of food systems to the different SDGs, the collaboration of key political, economic, and social actors and researchers is needed to jointly assess current food systems and subsequently work to frame future options. The methodological framework seeks to contribute to these objectives: to both build a shared vision of the current features and challenges of food systems at national scale and within subnational territories; and to inform the decision-making process to implement changes needed to improve food system sustainability in the short and long terms.

Section 1- Analytical framework: literature review, definitions and food system components

1 INTRODUCTION

The concept of food system emerged in the 1990s, initiating scientific discussion and analysis that have flourished over the last two decades. Louis Malassis defines food systems as "the way in which people organize themselves in space and time to obtain and consume their food" (Malassis, 1994). Over time, definitions and interpretations of food systems have evolved, largely spurred by industrialization and globalization of the food sector (Dury et al., 2019; Claquin et al., 2017). Recently, many authors have chosen to study food systems through a systemic lens (Allen and Prosperi, 2016; Béné et al., 2019; Dury et al., 2019; Melesse, 2019).

The systemic approach to food systems is acknowledged by the authors as a way to:

- Renew the perspective of food security analysis in a context of global changes.
- Embrace the multi-dimensionality of food systems: food systems do not only provide food but also help fulfil many of the other interlinked SDGs (Dury et al., 2019).
- Embrace all the food chains that make up food systems, the actors involved and activities they undertake, as well as the functions they perform to ensure the flow of food to consumers.
- Consider the "macro" and "direct" environments within which food systems' actors and functions operate, and which shape their activities and the resulting outcomes.
- Analyse the complex relationships between the diverse components of food systems, their effects on food security and social, environmental and economic sustainability. Systems thinking is also used to highlight the interactions and interdependencies within and between different scales, from the household to the global scale (Dury et al. 2019; FAO 2018a; HLPE 2017; Westhoek et al. 2016).
- Broaden policymakers' and stakeholders' sectoral viewpoints of the full scope of food systems.
- Identify trade-offs between conflicting outcomes and activities, as well as opportunities to create synergies and good strategies.

2 LITERATURE REVIEW

The existing literature on food systems underlines their complexity, underscoring the need for systemic thinking as the most appropriate approach to tackle their nuances and interconnectedness. (FAO 2018a; Foran et al. 2014; HLPE 2017; Berkum, Dengerink, and Ruben 2018; Westhoek et al. 2016; Vaarst et al. 2017; Ingram 2011).

In the literature, there are two types of methodological approaches for assessing food systems:

- Action-oriented methodologies. Action-oriented methodologies aim to build paths towards more efficient and sustainable food systems with involvement and input of food system stakeholders. Participatory approaches alone cover a broad spectrum of methods. They include: (i) stakeholder involvement in gathering information for assessments and in validating the results at the end of the assessment (Let's Food 2019; Prosperi et al. 2016); (ii) stakeholder involvement in identifying priority

issues at the local level (Ingram 2011) (Food Systems Dialogues 2019); and (iii) sustained participatory processes that enable stakeholders to assess the strategic options available regarding the future of food systems and identify transformative interventions (Dubbeling et al. 2017; Carey and Dubbeling 2017; FAO, RUAF, and Wilfried Laurier University 2018).

- Evidence-based assessments based on quantitative metrics. These methods exogenously assess the performance of food systems through quantitative statistics at national scale. Within this group, the systemic dimension of the assessment is uneven. The spectrum ranges from: (i) proposals of relevant indicators to guide the assessment without a systemic approach to understand how they interact (Zurek et al. 2017; Melesse 2019; World Bank, FAO, and RUAF 2017; Tefft et al. 2017; Allen et al. 2019;, IFPRI 2015; FAO 2018c; Béné, Prager, Achicanoy, Toro, Lamotte, Bonilla, et al. 2019; Gaitán-Cremaschi et al. 2018; Allen and Prosperi 2019); (ii) to selection of quantitative metrics of assessment, applied to cross-country comparisons of food systems (Nesheim et al. 2015; Béné, Prager, Achicanoy, Toro, Lamotte, Cedrez, et al. 2019; Chaudhary, Gustafson, and Mathys 2018; IFPRI 2015; Gustafson et al. 2016); and (iii) to modelling methods that attempt to model the interactions between food systems components (Allen et Prosperi 2016; Zurek et al. 2018). While the two first types of methods have been applied to case studies, no application of the third type based on modelling has been published to date.

The literature provides insightful lessons to this work. Our goal is to build a methodology that allows the rapid assessment of food systems in low-income and lower-middle-income countries (LIC and LMIC) in order to provide an initial, broad understanding of the current state of food systems and takes into consideration their multidimensionality.

The literature touches upon these aspects in the following ways:

- **Systemic approach.** There is a consensus on the need for systemic or holistic approaches, although the proposals are largely conceptual and the nature and intensity of the relationships between the food system components are not developed. Very few publications distinguish between outcomes and impacts, whether by type of actor, activities or type of food system. In particular, quantitative approaches often consist of a list of indicators, or aggregate indicators, and generally neglect the systemic dimension of the analysis.
- **Generic vs. specific.** Most of the approaches proposed in the literature are not specific to a particular context. They are replicable at a given scale (either national or city-region) and in different contexts, allowing for comparisons. However, they are limited to that scale, and are consequently not generic. In addition, national-scale and quantitative methods involve a risk of ignoring countries where data are lacking, which, are arguably those where the issues are the most critical. In the data collection process, the focus is rarely adapted to LIC or LMIC countries, or to distinguishing rural or urban areas or subnational levels.
- **Dynamics.** Most conceptual frameworks emphasize the dynamic nature of their approach, acknowledging that a change in one system component will eventually ripple through the system and trigger a range of changes, including feedback loops. Conceptual frameworks that have been developed around resilience/vulnerability concepts are particularly focused on dynamic processes

across food systems components. However, no operational examples or case studies were identified.

- **Territorial perspective.** The territorial consideration is considered in most action-oriented methodologies that rely on participatory approaches. However, they focus on the city/region level. There is no evidence of their application at a subnational scale. National-level quantitative assessments do not account for the spatial heterogeneity of food system performance, and local agro-socio-ecological contexts are rarely recognized.
- **Policy dialogue.** Many approaches acknowledge the need to provide food system assessments that feed the policy dialogue. However, the suggestions for actively involving stakeholders in the process are uneven and unclear and the methodological approaches are quite heterogeneous. Moreover, methods are mostly silent on how to translate insights into actionable interventions as well as on the issue on how to involve stakeholders in long-term policy design processes.

This methodology proposes a systemic orientation that is sufficiently generic to be applied to a wide range of LICs and LMICs. It will include the following features: a mix of quantitative and qualitative analysis to involve stakeholders and to accommodate environments where data or documentation is poor; a dynamic perspective, considering the performance of past food systems and forecasted trends for some key drivers/impacts; a territorial perspective and recognition of local context; and a decision-maker's perspective to inform policy dialogue.

3 DEFINITION OF FOOD SYSTEMS

The concept of food system is defined in different ways in the literature. Most definitions mention how a food system is shaped by the environment in which it is embedded and how it produces diverse outcomes. However, some of the definitions do not clearly distinguish between the nucleus of the system (actors and functions along food chains), the drivers that influence them, and the resulting outcomes. Generally no distinction is made between the "macro" drivers and the "direct" environment within which actors evolve. In addition, little mention is made of the internal drivers that affect actors' decision-making and system functions. Interactions between food system components, and the feedback loops between outcomes and drivers, are generally neglected. Although food and nutrition security and socio-economic and environmental outcomes are mentioned in almost every definition, the impact of food systems on balanced territorial development is usually excluded. Beyond the standard production–processing– distribution–consumption functions, some definitions include the farming input industry, transport, or food disposal. When food disposal is included, the management of waste generated in each segment of the food chain is still lacking. Finally, the critical inter-relationships between food systems actors and those in non-food or non-agricultural functions are also rarely mentioned.

Based on this review of definitions, we propose the following holistic or systemic definition of food systems, emphasizing the following specificities:

- The broad range of drivers that influence food systems, including internal drivers related to the dynamics of the actors and proximate actors' environments.

- A broad range of outcomes (beyond the "standard" goal of food and nutrition security), including economic, socio-cultural, biophysical and environmental dimensions and outcomes related to governance and territorial balance.
- A clear distinction between the core or nucleus of food systems (i.e. the actors and activities), the drivers influencing them, and the resulting outcomes and impacts.
- Waste management as one of the key functions in the core system.
- Inclusion of the non-food agriculture sector, its diverse contributions to food systems (e.g. energy, transport, education, health), and the critical inter-relationships between agriculture and food and non-food functions.
- The interactions between the different parts of the food system (interdependencies, trade-offs, synergies) as well as feedback loops.

Building on these specificities, food systems can be defined as follows (definitions of related food systems concepts are defined in Appendix Table 1).

Food systems: broad definition

Food systems encompass the entire range of actors and the functions involved in the production, aggregation, transport, processing, distribution and consumption of food products that originate from agriculture, forestry or fisheries, including the inputs used and the management of waste generated by each of these activities. The core actors and activities in food systems are interconnected with non-food agriculture production systems.

Influenced by interlinked social, political, cultural, technological, economic and environmental drivers (as well as their direct environment), food system actors and functions generate outcomes and have long-term impacts in four main dimensions: (i) food security, nutrition and health; (ii) socio-economy; (iii) territorial balance; and (iv) environment. Outcomes and impacts are interconnected while outcomes and drivers are linked through feedback loops and synergies. The whole system involves a variety of private, public and civil society actors, requiring governance across and within levels of government.

Food systems: concise definition

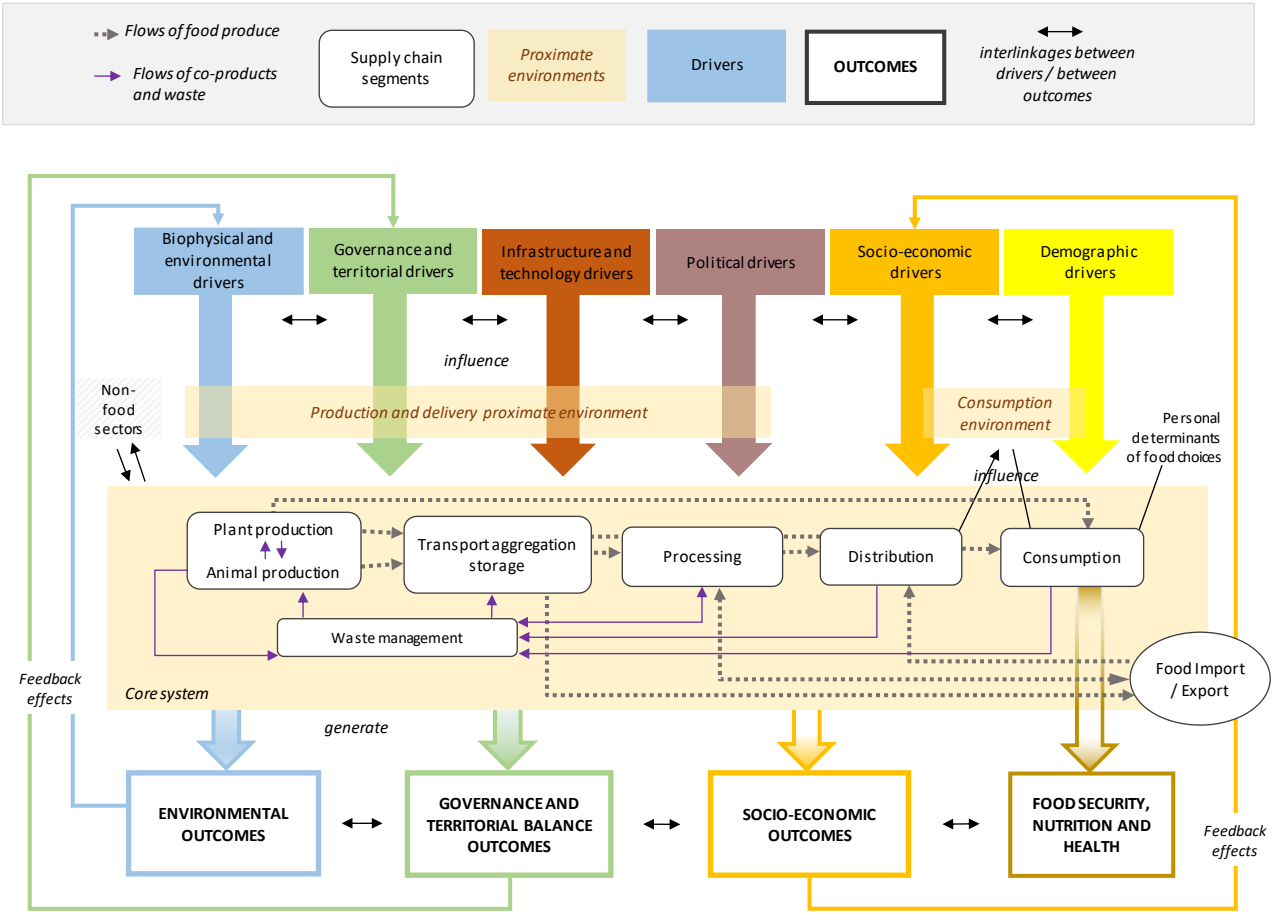
Food systems encompass the range of actors and their activities involved in food chain functions, including their drivers, their direct environment as well as their outcomes and long-term impacts on the main sustainability dimensions, which in turn affect drivers via feedback loops.

4 FOOD SYSTEM CONCEPTUAL FRAMEWORK

The conceptual framework articulates five components comprising food systems: (i) food chain actors and functions; (ii) drivers; (iii) direct environments: food production and delivery; (iv) consumption environments; and (v) outcomes and impacts (see Figure 1). A description of each component is provided after the figure.

Food systems are not static. The entire system is dynamic, affected by diverse trends and shocks influencing external and internal drivers. Some of the outcomes, specifically those related to environmental, social-economic, governance and territorial dimensions, act reciprocally through feedback loops to also affect systems.

Figure 1. Food system conceptual framework



- ✓ Food chain actors and activities: the core system

The core system or nucleus of the system includes the entire range of actors and their interlinked functions along food chains. Producing, storing, transforming, processing, distributing, consuming and waste management are all core system activities. Consumption includes buying, preparing, preserving and eating, with habits determining the overall demand in terms of quantity, quality, and diversity. The core system is characterized by flows of money, information, food and food waste/co-products. In addition, we consider imports and exports as the flows and the actors that directly interact with the other actors and activities in the core system. The agricultural non-food sector interacts with the core system, affecting structural and agriculture transformation, influencing jobs, income levels and wealth, or conditioning competition for land or water use. It may also be a relevant supplement to food production in terms of resource-use efficiency.

- ✓ Drivers

The entire range of actors and activities in food systems are shaped by drivers. Drivers modify activities in the short and long terms, and subsequently influence the outcome and impacts of the system.

Drivers are the "endogenous or exogenous processes that deliberately or unintentionally affect or influence a food system over a long enough period so that their impacts result in altering durably the activities, and subsequently the outcomes, of that system" (Béné, et al. 2019). Six types of drivers are considered in this framework: biophysical and environmental drivers; demographic drivers; socio-economic drivers; political drivers; governance, stability and territorial drivers; infrastructure and technological drivers. In the notion of drivers, we also include internal innovations and dynamics driven by the actors of food systems, whether public or private.

- ✓ Direct environments: food production and delivery

Beyond these drivers, the 'direct' environment in which actors operate influences the way the food systems function as well as actors' behaviour (practices) and performance.

Actors operate in an immediate ('direct') production and midstream environment. This direct environment refers to the close-by knowledge and financial, technical and other services, as well as the institutions (e.g. producer organizations, industry groups, markets) that define the structure of the core system. It determines actors' activities, affects their performance and influences how system core functions (from production to logistics, processing and marketing) are carried out. Understanding the direct production and midstream environment helps to separate drivers and trends influencing producers and midstream actors (such as policy, infrastructure or trade agreements) from the drivers affecting opportunities and directly determining the choices available to actors. This introduces a third way to qualify the drivers: beyond endogenous vs exogenous and intended vs unintended factors, we also suggest the need to consider the direct vs indirect/overall influence on the food system actors (namely, those that directly influence actors' actions), and those exerting a global (societal or economy-wide) effect.

- ✓ Consumption environment[2]

Personal preferences as well as the direct environment within which consumers purchase, prepare and consume food influence consumer behaviour; this is called the "consumption environment". The personal determinants of consumer behaviour include preferences, values and skills, time and lifestyle, purchasing power, and household size and age of household members.

[2] We chose not to use the concept of "food environment" used in the literature on food systems (HLPE 2019; Bene 2019a). This for two reasons: (i) the concept of "consumption environment" makes it possible to draw a parallel with the direct production and delivery environment while emphasizing the consumer as actor; and (ii) the widening definition of food environment, which now covers the "physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food", including the "personal determinants of consumer food choices (e.g. income, education, values, skills etc.)" and hence requires a large number of drivers to be operational.

The consumption environment represents the interface between food distribution actors and activities and consumers. Keys elements are the availability of food in terms of: proximity/physical accessibility of sales points (which may include both the physical spaces where food is obtained and the infrastructures that allow consumers to access these spaces); diversity; affordability; promotion/advertising/information; labelling; and product safety and quality. This environment derives from activities in the production and midstream segments, as well as political and infrastructure drivers. Because they partly determine what foods consumers can access at a given time, at what price and with what degree of convenience, consumption environments both constrain and prompt food choices.

- ✓ Outcomes and impacts

Finally, food system actors and functions generate outcomes and long-term impacts in four dimensions: food security, nutrition and health; socio-economy; territorial balance; and environment. As mentioned in the Introduction, these dimensions are broken down in four core goals to meet the sustainability goals of food systems:

1) Food security, nutrition and health: Ensure food security and provide healthy, balanced and nutritious diets, to contribute to health for all.

2) Socio-economy: Provide decent livelihoods and jobs for all food system actors, notably smallholders, women and youth, contributing to inclusive economic growth through the food sector (from production to distribution) and an improved food trade balance.

3) **Territorial balance:** Contribute to balanced power distribution and territorial development, fostering stability and equity among food system actors.

4) Environment: Manage, preserve/regenerate ecosystems and natural resources and limit their effects on climate.

These four food system outcomes and long-term impacts are interlinked. For instance, socio-economic and environmental outcomes influence the capacity of food systems to achieve food security, nutrition and health. The current outcomes and impacts are determining factors for building pathways towards sustainable food systems.

Section 2- Food system assessment methodology

1 INTRODUCTION

1.1 Users

A food systems assessment, as proposed in this methodological framework, is oriented to donors, policymakers and local authorities, as well as key private, public and civil society food systems stakeholders. The methodology aims to involve these stakeholders in the co-creation of the food systems analysis. The range of stakeholders involved will depend on each local situation. Stakeholders will participate and contribute both as interviewees and in workshops to share views on food systems, which could be addressed at national and subnational scales. The assessment process and results will provide a broad understanding of food systems challenges and opportunities for action to improve their sustainability.

The assessments will be implemented by external experts (either national or international) who will be responsible for adapting and facilitating the assessment process in the country concerned.

1.2 General objectives and levels of analysis

The overall objective is to help guide and improve interventions to promote more sustainable food systems.

The specific objectives include:

- Raising the awareness of public sector actors (at multiple levels), food systems stakeholders (private sector and civil society) and financial partners on the relevance of the food systems approach.
- Providing an initial broad understanding of the state of national and subnational food systems (with respect to the core sustainable food system (SFS) goals and considering territorial differences), highlighting current performances, trends, challenges and opportunities.
- Facilitating dialogue among food systems stakeholders, policymakers and local authorities to co-construct a shared, multidimensional and dynamic vision of food systems and to discuss future actions to achieve SFS goals.

The present method was elaborated with the idea of building pathways towards more sustainable food systems. The direction of these pathways will depend on strategic decisions and concrete actions undertaken by food systems stakeholders at territorial or subnational levels. Territorial approaches make it possible to formulate a future food systems vision, framing actions that respond to local (and often global) challenges, and crucially relying on local actors, opportunities and resources for its implementation. National-level diagnosis is an initial first step of assessment, even if there is interest in engaging with local actors to co-construct sustainable food systems at a subnational, territorial scale. Indeed, the national scale brings together numerous elements (e.g. policies and budgetary decisions, financing) that exert an important long-term impact on food system sustainability. This national dimension includes infrastructure, policies, and business and trade environment, among others. This first-level analysis makes it possible for stakeholders to reach agreement on the importance and nuances of the core SFS goals at the national level,

while identifying subnational issues that face specific combinations of challenges. These territories are then the appropriate spatial units to use when deciding on strategies and where interventions are more likely to lead to concrete and sustainable impacts.

1.3 Expected results of implementing the methodology

The results expected from implementing the methodology include:

- Providing an overview of the food systems performance with respect to the four SFS goals as well as the most pressing challenges, through a comprehensive understanding of the multidimensionality of food systems outcomes, their main characteristics, their main drivers, and past and forecasted trends.
- Identifying and characterizing territorial food systems and their boundaries in function of their actors and activities and their combinations of challenges with respect to meeting SFS goals.
- Identifying, through a collective process involving a broad range of stakeholders, system bottlenecks and levers, while building up transformative pathways for more sustainable food systems.
- The results will be presented in policy briefs and country reports. A policy brief prototype and a report outline are provided in the toolbox. See [7 WRI - Policy Brief_Rapid_V3.pub] and [7 WRI - Deliverable Country Report Outline.docs].

2 FOOD SYSTEM ASSESSMENT TO ADDRESS LOCALLY RELEVANT ISSUES

2.1 Guiding principles of the assessment at national and subnational levels

Box 1. Outlines of policy briefs (proposed)

The Policy briefs will present the essential findings of the assessments and key messages for decision-makers.

- How well does the food system perform with respect to the four sustainable food system goals? Key figures, key trends, the most critical challenges to reaching sustainable food system goals, hard-hitting messages.
- How are food systems structured across the country?
  - Key figures and trends in food consumption and production patterns across the country
  - Key actors of the food system and their relative importance.
  - Degree of integration of different actors and various supply chain governance modes of integrated, and how this affect systems' resilience to shocks.
- What are the drivers that generate the major risks and opportunities to achieve sustainable food system goals? Key demographic trends; policies, programmes, strategies with respect to sustainable food system goals; socio-economic drivers; infrastructure and technologies; trends in natural resources and climate features; and food system governance and general governance, at national and territorial scales.
- How are food system performance and related risks distributed across the country? A map of the country divided into homogenous subnational food systems and the main features of each.
- How does the performance of the food system perform in terms of its core goals? A summary of core data and insights, the territories in which the challenges are the most serious, historical trends and forecasts, and the risks/opportunities linked to the current and future drivers of the food systems.

The assessment will be based on the principles described in the paragraphs that follow.

Providing a multidimensional overview of food system challenges

The assessment will cover the four dimensions of sustainable food systems and will provide a multidimensional overview of the contribution of food systems to sustainable development goals while solving key food system-related challenges.

Based on an initial workshop, the four broad (core) SFS goals will be qualified to reflect the particular challenges the country concerned is facing. These goals will be reframed considering potential specificities relative to key issues, the target population (e.g. women, youth, the poor) or the subnational areas the most at risk. Beyond the assessment of food system performance (outcomes and impacts with respect to the four core goals), the main actors and activities of the existing food systems will be characterized, along with their spatial distribution across the country. Where possible, the relations between the actors of the

system "black box" (i.e. the midstream segments between production and consumption) will be identified. The various types of drivers that shape food systems will also be taken into account.

⇨ **The assessment will identify the multiple contributions of food systems to achieving the Sustainable Development Goals.**

Framing the key issues

The assessment requires finding a constant balance between dealing with complexity and preserving relevance. Therefore, we consider it important to frame the assessment at the onset by jointly specifying and qualifying the main food system challenges and goals. This will facilitate stakeholders' involvement in the assessment process while ensuring that the assessment yields operational results and helps identify the range of possible pathways towards transformative actions.

⇨ **The assessment is linked to the main national and subnational issues**

Considering spatial and territorial heterogeneity

The assessment will highlight the spatial and territorial heterogeneity between key actors, activities, drivers, outcomes and impacts across the country. For example, it will report on the spatial distribution of the main food production areas and consumption centres across the country while identifying areas of food surplus and deficits. It will describe the dynamic linkages with other key economic sectors. The approach will capitalize on all available sources of spatialized information in order to identify and qualify territorial food systems, i.e. subnational areas where food systems are facing characteristic combinations of challenges and opportunities to meet their sustainability goals.

⇨ **The assessment will identify the subnational specificities of food system challenges**

Assessing key trends

Combinations of trends at global and national scales can have a multiplier effect, which can drastically increase the systemic risks that threaten national food systems' capacities to meet their sustainability goals in the four dimensions. The assessment will consider food system dynamics and uncertainties, assessing past trends and relevant forecasts concerning food system drivers and performance (e.g. demography, food security, employment, impact on farming-dependent livelihoods). Some indicators that provide information on food system exposure to risks and food system resilience factors will also be considered, including, resilience to pandemics, dependence on input and food imports, dependence on export revenues, cereal reserves, tariffs, diversity of production, diversity of supply chain structure and organization, and marketing, among others. Internal trends, such as major technical or institutional innovations addressing food system challenges, will also be identified.

⇨ **The assessment will emphasise current as well as future challenges in terms of food system's sustainability**

Using quantitative and qualitative data

The method will be adapted according to the availability (or lack) and the quality of data, while making the underlying assumptions/limitations/validity of the proposed indicators explicit. A combination of

qualitative (based on local key informant interviews and secondary qualitative data) and quantitative data will be used.

⇨ **The method will help to build a consistent narrative based on the main challenges at national and subnational levels, including quantitative evidence when available.**

Facilitating action-oriented decision-making

The assessment will provide information which will mainly address policymakers but will also be readable by people with different backgrounds and objectives. The assessment aims to foster a common vision of the food systems' main challenges at national scale, considering spatial differences across the country. It will pave the way for an in-depth diagnosis of the food systems at territorial scales, before any interventions/actions are defined.

⇨ **The assessment process and output will be oriented toward decision-makers**

Using a participatory approach

The methodology, especially the extended-one assessing territorialized food systems, will rely on participatory approaches. food system stakeholders will be involved in order to contribute to the food system assessment and enrich the primary overview of food systems, which is mostly quantitative. Indeed, multistakeholder consultation and dialogue are valuable throughout the process, from identifying priority issues to designing actions. In particular, the stakeholders will contribute to three steps of the process: (i) initial framing of the main issues; (ii) documentation of food system characteristics, performance, risks and opportunities through individual interviews; and (iii) participating in the final workshop, aimed at achieving a shared understanding of the state of the food system and key challenges.

⇨ **Food system stakeholders will be involved throughout the process**.

Facilitating iterative processes

The assessment will be an iterative process. In particular, the interviews with key informants will provide relevant elements to improve the interpretation of the quantitative evidence gathered in the initial steps. The methodology will seek to capture system complexity and necessary simplifications, while navigating between comprehensive national-level insights and (often sparser) information at subnational levels.

⇨ **The assessment process foresees expert workshops to build up consensus on observed complexity and arrive at workable simplifications (e.g. typologies of actors)**

Based on a **multidimensional** and **dynamic** overview of food systems and a **spatial distribution** of actors or activities, drivers, outcomes and impacts across the country, the assessment will improve the understanding of **current and future** challenges faced by food systems at national and territorial scales that threaten their sustainability and resilience. The food system assessment will facilitate the **engagement of actors in the most stringent challenges and transformative interventions** towards more sustainable food systems.

2.2 A modular methodology: rapid/extended approach

The assessment can be either rapid or extended. A similar approach will be used for the two, enabling the rapid version to be easily expanded into a more in-depth understanding of the food system.

The rapid assessment is presented in detail in the pages that follow. It requires three experts (ideally three national experts), each for a period of approximatively 35 working days. An additional expert in participatory approaches is also required. He/she will be in charge of facilitating workshops. An approximate breakdown of man-days according to experts and according to the different steps and tasks is provided.

The extended assessment is presented in Appendix 2 and requires three national experts, each intervening for a period of approximatively 70 days.

In both the rapid and extended assessment, as a team the experts should have expertise on quantitative analysis based on international and national databases, practices of territorial approaches, sensitivity to systemic approaches and expertise in policy dialogue. Beyond indispensable transversal skills (i.e. very good ability to synthesize and analyse quantitative and qualitative data, excellent writing skills, good knowledge of national and international institutions working in the field of agricultural and food systems, good knowledge of the country's major food system challenges, proven ability to carry out studies in a multidisciplinary team environment, and relational qualities), three profiles of national experts are sought:

- Socio-economic issues in the agriculture/food sector and food security (micro)
- Natural resources and environmental issues
- Politics, value chains and governance

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There are no differentiates terms of reference for each of the consultants. All consultants are involved in all steps. For all tasks, they must work together as a team and collectively divide the activities between them, according to their fields of expertise.

The experts will receive methodological guidance including training and support from external experts, as well as the present methodological guide and tool kit.

2.3 The rapid methodology in six steps

The rapid methodology is structured in six main steps. Table 1 lays out the steps and the nine types of tasks that are required in the six steps. Table 2 summarizes the objectives and methods used in the six steps, which are then detailed in the guidelines that follow.

The extended version of the methodology comprises eight steps, structured in the same tasks, but in more detail. Appendix 3 provides a comparison between the rapid and extended versions, as well as further details for the extended version.

Table 1. Types of tasks in rapid assessment's steps

Types of tasks	Step A -- Framing the issue	Step B -- Document and data analysis	Step C -- Qualitative appraisal and mapping	Step D -- Share, discuss and reach agreement	Step E -- Summarize
Indicators		B_Ind			
Documents		B_Doc			
Trends		B_Tren			
Food consumption/ production/ **bal**ance		B_Bal			
Types of food system actors			C_Typ		
Interviews			C_Int		
Analysis			C_Ana		
Share	A_Sh			D_Sh	
Write					E_Wri

Table 2.Timeline of the rapid assessment: steps and tasks

Steps	Objectives of the tasks	*Method to be used for the tasks*	*Consultants*
Step 0: Prepare[1]	To select national experts To become familiar with the methodology To prepare the initial workshop To identify participants for the workshop as well as key informants for interviews	*[1] Step 0 needs to be scheduled well before the beginning of the study* *Identify, select and recruit experts* *Training* *Identify and invite the participants for the workshop; identify informants to interview* *Prepare a short list of key FS challenges in the country based on the literature, policy documents, strategies*	5 days x 3 consultants
Step A: Framing the issues	To bring in/involve stakeholders in a joint food system assessment process To identify and discuss the key challenges faced by the food system to meet sustainable goals in four dimensions order to frame the assessment according to local specificities	*Prepare, facilitate the workshop and harvest the results*	3 days x 3 consultants
Step B: Document and data analysis	To provide a general overview, at national of the many different dimensions affected by the food system (outcomes) and the drivers of changes to food systems – focus is made on the key issues identified in step A To identify the most urgent challenges related to these outcomes, impacts and drivers To provide an overview of the relative share of food categories and the balance between the domestic and the international market	*Quantitatively and qualitatively document current food system outcomes and key drivers at national* *Using a scoring method based on LIC/LMIC's distribution of values, provide quantitative indications on the challenging outcomes* *Document key trends (forecasts based on historical data and projections, when available) concerning key outcomes and drivers at national scale; identify critical trends that affect SFS goals* *Document available statistics on the main food and non-food products (production, exports, imports) and the food*	5 days x 3 consultants

		balance for the main categories of food products, and in calories *Start gathering thematic maps regarding the four dimensions of sustainable food system (used at the end of step C)*	
Step C: Qualitative appraisal and mapping	To identify and characterize the main actors and activities in each segment of the food system and related non-farm activities To map actors and activities To enrich the overview of performance, priorities and challenges with qualitative appraisals of stakeholders and experts in the different domains To explore the diversity of situations across the country being assessed	*Conduct a series of individual interviews with key informants on different topics (around 20 interviewees):* • *food security//nutrition/health* • *Environment and natural resources* • *Poverty, employment, livelihoods* • *Midstream segments and markets* • *Stability, risks, territories, governance issues* *Elaborate a preliminary typology of FS actors and activities, based on the consultants' experience and complementary data* Organize and facilitate a task force aiming at mapping the key actors/activities distribution in the FS territories *Based on the maps prepared in interviews and thematic maps from literature, prepare a synthetic map (delineation of territorial FS)*	4 days x 3 consultants
Step D: Share, discuss and reach agreement	To raise the awareness and reach a shared understanding among stakeholders on the rationale for adopting a multidimensional, systemic and territorially differentiated vision of the food system	*Organize a synthesis workshop to present the results, discuss the rapid assessment and validate key current and future challenges to achieve core SFS goals at national and territorial scales*	3 days x 3 consultants

	To reach a shared understanding of key current and future challenges to achieve core SFS goals at national and territorial scales To agree on territories within which the challenges to reaching SFS goals are relatively homogeneous		
Step E: Summarize	To provide a systemic and territorially differentiated summary of the outcomes, impacts, drivers and trends of the food system, including quantitative indicators and qualitative appraisal, in a multidimensional view	*Write a policy brief of the food system assessment*	10 days x 3 consultants

3 GUIDELINES FOR IMPLEMENTING THE RAPID METHODOLOGY

3.1 Step 0: Preparing the assessment

Prior to the assessment, about one week will be needed to prepare for it : for the experts to become familiar with the methodology, to identify participants for the first workshop, and to schedule the workshop and the interviews with key informants.

The initiator of the study (the founder) will have a role to play in the identification and the recruitment of the experts and again at this stage of preparation. The initiator of the study will assist the experts in identifying and soliciting the participants for the kick-off workshop as well as the key informants.

3.2 Step A: Framing the issues

✓ Purpose

- To identify and agree on the most important challenges to meet sustainability goals in the four dimensions of SFS
- To sensitise key stakeholders to FS approach and involve them to the assessment process

✓ Rationale

Food systems are extremely complex, and capturing the full extent of this complexity is clearly beyond the scope of this methodological framework. The assessment needs to focus on the key issues, in order to target the most pressing challenges.

Tasks ASh: Kick-off and initial brainstorming to specify/qualify food system main challenges

✓ **Method**

- As a preparatory step, a preliminary review and synthesis of data and policy documents should be done:

- Characterize public policies, government strategies and programs on the four dimensions of a sustainable food system; review of reports and analyses published by different actors on the field of FS (NGOs, OP, FAO, EU...)
- Identify governance mechanisms (inter-ministerial coordination, decentralization, ongoing political dialogues, informal institutions, etc.)

From this desk preparatory work, a preliminary shortlist of FS's key challenges/problems at the national level to improve sustainability of FS is proposed and further discussed in the workshop. Challenges/problems must cover the four dimensions of FS sustainability impacts (at the bottom of the conceptual framework).

- One-day kick-off workshop with 20-30 key stakeholders.

A multi-stakeholder dialogue will help framing the key issues (as collectively perceived at the initial stage of the assessment). The kick-off workshop should include the initiators of the study, representatives of the FS stakeholders, representatives of the government , donors, NGOs as well as leading national and international civil society organizations involved in agricultural and food issues, and possibly some major experts of the topics. The kick-off workshop includes both plenary and working group sessions.

The main expected result is to co-construct a shortlist of FS's key challenges/problems at the national level regarding sustainability of FS. Another expected output is to collect participants' perceptions of the main

causes of these major problems. While the major challenges/problems are about FS outcomes on the four sustainability dimensions (at the bottom of the conceptual framework), the causes are either FS drivers/direct environment (at the top of the conceptual framework) or specific FS actors or activities (core system). Theses causes will be not discussed during the kick-off workshop, but subsequently exploited in step C.

✓ Guidelines and tools

For the preliminary data and literature review, see Guidelines and tools for tasks BInd, BDoc, and BBal (below).

[A _SH documents à rassembler avant le kick off.docx]

[A_SH C_INT D_SH - Guidelines to choose process participants 11 09.docx]

[A_SH Grille choix participants.xlsx]

[A SH - Kickoff meeting guidance -draft 31.08.docx]

3.3 Step B: Documenting the main challenges of food system at national scale

✓ Purpose

To generate a first set of "facts and figures" about (i) the outcomes of the food system in the four dimensions with a focus on the main challenges identified in step A and (ii) their most important causes that could be food system drivers and trends, and/or linked the core food system (actors and their functioning).

✓ Rationale

The national scale often includes too much diversity to properly characterize and assess a food system. However, it is essential as it is the main level of political, bilateral aid and budgetary decisions. Both quantitative and (primary and secondary) qualitative data will be used in this step. This makes it possible to build a consistent narrative concerning the main challenges at national scale, together with quantitative evidence.

Tasks BInd, BDoc and BTren: Overview of drivers, outcomes and trends

✓ Purpose of tasks BInd, BDoc and BTren

- To gather essential insights on the drivers shaping food systems while capturing the dimensions that are most affected by food system (outcomes) at national scale
- To identify the most critical challenges (in the present or in the coming decade) posed by these food system outcomes and drivers

Tasks BInd, BDoc and BTren will be implemented simultaneously in order to gather the initial data needed to analyse the main components of the food system. The overall output expected from BInd, BDoc and BTren is a qualitative and quantitative documentation of the FS's key challenges/problems at the national level as well as their related causes (drivers, outcomes, core system functioning). The consultants are expected to analyse and discuss the given qualitative and quantitative data with respect to their possible consequences in the future, in a "business as usual" scenario. How do these facts, figures and trends affect the various dimensions of the food system? This reflection should consider the interactions between the four core impacts dimensions.

✓ Method of tasks BInd, BDoc and BTren

The assessment covers eight dimensions related to the four core SFS goals (outcomes), six sets of drivers, and the direct environments in which food system actors operate (see Figure 1). The eight dimensions are disaggregated into subdimensions and categories (see Table 4). All of them can be approximated using quantitative data, proxies and/or qualitative insights (collected in interviews with key informants (see task 3Int) or in a review of the literature/websites). This is particularly the case of policy and governance dimensions.

Table 3.Dimensions, subdimensions and categories

Dimension	Subdimension	Category	Drivers	Outcomes/ impacts
Biophysical and environment	**Water**	Water consumption	1	1
	Water	Water availability	1	1
	Water	Water management	1	1
	Water	Water quality		1
	Mineral	Resource consumption	1	1
	Fossil energy	Fossil energy consumption	1	1
	Biodiversity	Pesticide	1	1
	Biodiversity	Agro-biodiversity	1	1
	Biodiversity	Forest and natural areas	1	1
	Biodiversity	Fish resources	1	1
	Land	Soil quality	1	1
	Land	Land efficiency		1
	Climate	Emissions	1	1
	Climate	Trends	1	
	Climate	Shocks	1	
Demography	**Population**	Growth	1	
	Population	Urbanization	1	
	Population	Dependency ratio	1	
	Population	Density	1	
	Migration		1	
Policy	**Policies and regulation**	Production	1	
	Policies and regulation	Environment	1	
	Policies and regulation	Nutrition & health	1	
	Policies and regulation	Animal & human health	1	
	Policies and regulation	Food safety	1	
	Policies and regulation	Food system & supply chains	1	
	Policies and regulation	Food waste & loss	1	
	Policies and regulation	Trade policy	1	
	Policies and regulation	Labour income & equity	1	
	Policies and regulation	Food storage	1	

	Public budget	Innovation & research	1	
	Public budget	Environment	1	
	Public budget	Agriculture, fisheries, forestry	1	
	Public budget	Poverty alleviation	1	
	International aid	Agriculture	1	
	International aid	Environment	1	
	International aid	Rural development	1	
	International aid	Agro-industry	1	
	International aid	Food aid	1	1
Governance & balanced territorial development	**Monitoring capacity**	Data availability & monitoring	1	
	Monitoring capacity	Animal & human health monitoring	1	
	Governance & participation	Public governance	1	
	Governance & participation	Civil society participation in food systems governance	1	1
	Governance & participation	Gender in politics	1	
	Governance & participation	Equity in land access		1
	Territorial balance	Access to capital	1	
	Territorial balance	Well-being	1	1
	Political stability / conflicts	Displacements	1	
	Political stability / conflicts	Security	1	
Infrastructures & technical services	**Infrastructures**	Roads	1	
	Infrastructures	Potable water	1	
	Infrastructures	Sanitation	1	
	Infrastructures	Electricity	1	
	Information and communication technology (ICT)	Mobile phone	1	
	ICT	Use of ICT/internet	1	
Socio-economy	**Social**	Gender	1	
	Education	Level of education	1	
	Labour & Equity	Employment structure		1
	Labour & Equity	Labour productivity		1
	Labour & Equity	Working conditions		1
	Income & Equity	Poverty	1	1
	Income & Equity	Income distribution	1	1
	Income & Equity	Income	1	1
	Macro economy	Wealth & growth		1
	Macro economy	Internationalization	1	
	Trade	Import - Export		1
	Food balance	Food imports- exports		1
	Food balance	Food balance		1
	Food balance	Food production		1
	Prices	Prices of inputs	1	
	Prices	Prices of agriculture products	1	1

Consumption environment	**Availability**	Seasonality	1	
	Affordability	Food prices	1	1
	Physical Access		1	1
	Food safety	Potable water	1	
	Food safety	Cooking conditions	1	
	Food quality		1	1
	Food promotion, advertising and information		1	1
Production & delivery environment	**Access to inputs**		1	
	Access to credit		1	
	Access to other services		1	
Food security, nutrition & health	**Diet**	Quality of diet		1
	Food security	Availability& affordability	1	1
	Food security	Availability	1	1
	Food security	Affordability	1	1
	Nutrition	Malnutrition		1
	Food safety	Food-borne diseases		1
	Food Loss and waste			1
	Health	Diet-related non-communicable diseases		1
	Health	Mortality		1
	Health	Zoonotic diseases		1
	Health	Workers' health issues		1

BInd Documenting food system outcomes and key drivers at national scale through quantitative indicators

✓ Method

A list of more 92 quantitative indicators covering the different dimensions is provided in Guidelines and Tools (B IND_TREND_BAL - INDICATORS Selection). Of these 92 indicators, about 40 will be essential to orient brainstorming and initial framing of key food system challenges at national level (see Step A – task ASh); see the list and source of these indicators below. The selection of indicators was based on their potential to reveal possible key drivers and outcomes while covering the different dimensions, but also on their availability in LICs/LMICs. Most of them are available, either on international data base websites, or in standard national statistics or surveys. If the indicator is not readily available, a second-best way to describe the given category is suggested. The experts will make use of absolute values or percentages, using the most recent data to characterize components of the food system.

As absolute values and percentages are often meaningless (mostly to non-specialists of the dimensions concerned), indications are provided to score each indicator from 1 to 5; 1 being the less favourable condition and 5 the most favourable, with respect to the core SFS goals. For scoring, we suggest using the position of the country in the quintile distribution of values, either for LIC/LMIC or for all countries. These

scores make it possible to carry out a preliminary identification of drivers and outcomes that are challenging the sustainability of food systems.

For some of the subdimensions, quantitative indicators are lacking or incomplete. They need to be complemented by qualitative information. A complement of 40 qualitative indicators (or questions) is suggested in the indicator list.

If the experts consider that a subdimension or category that is particularly important for a given context is not covered by the proposed set of indicators, they may add others. For example, coastal countries may add a quantitative indicator on fish stocks in national maritime areas.

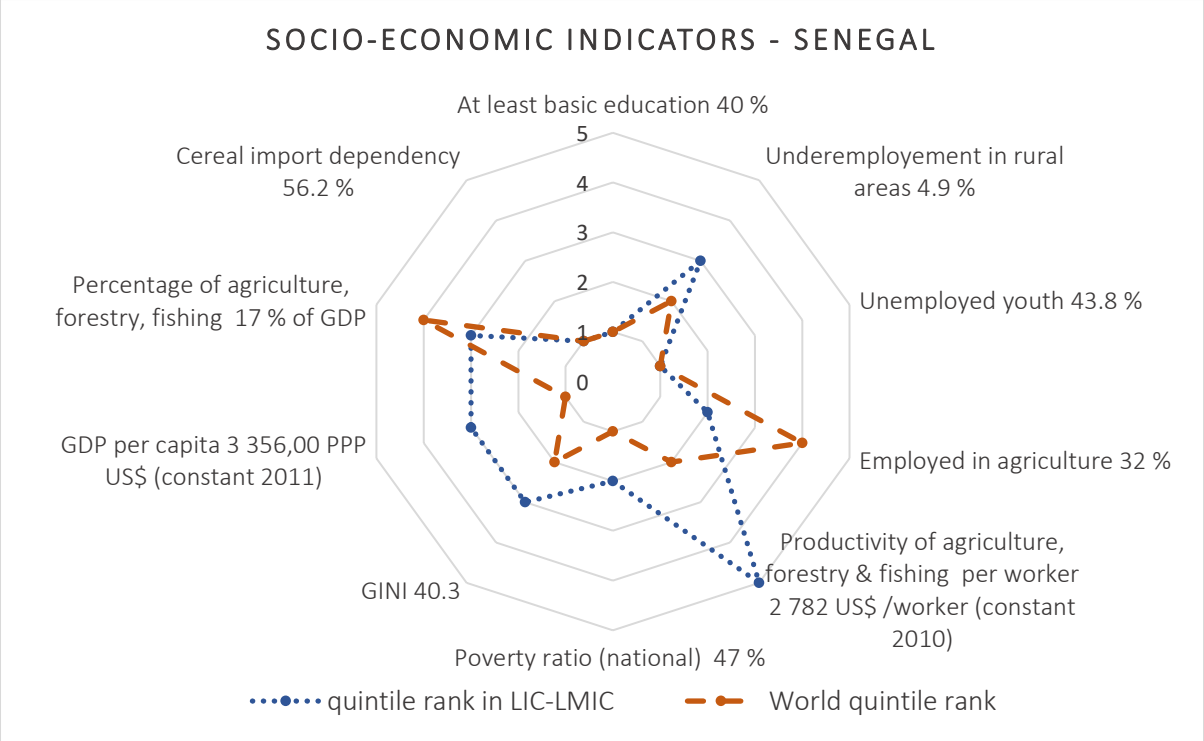
- ✓ Outputs

The results will be presented in tables and spider diagrams. The tables should include the most recent value for each indicator and the country's rank in the LIC/LMIC or world quintiles. The consultant will draw as many spider diagrams as there are dimensions (see 2, with illustrations from Senegal).

Box 2. Table and spider diagram presenting a selection of indicators and country's ranking in the LIC/LMIC or world quintiles (the case of Senegal)

Dimension	Sub-dimension	Category	Indicator	Senegal value	Unit	Year	Ranking / LIC LIMC	Ranking / Word
Biophysical and environment	Resource consumption	Water	Agricultural water withdrawal	92	% of total water withdrawal	2002	1	1
		Water	Water stress	11.81	% of water resource	2002	2	3
		Water	Cultivated area equipped for irrigation	3.9	% of cultivated area	2002	2	2
		Mineral	Nitrogen use	11	kg/ha	2017	4	4
	Biodiversity	Natural areas	Share of forest area	43	% of land area	2015	4	4
		Natural areas	Evolution of forest area	-3.2	points	2000 - 2015	2	1
		Natural biodiversity	Pesticides used per crop land	186	tonnes/ha	2017	3	4
	Climate	Emission	Total GHG emission $C0_2eq$	4 043	kg/cap	2012	2	4
		Emission	Agriculture CO_2eq emissions	728	kg/cap	2017	3	3
		Emission	Land use CO_2eq emissions	290	kg/cap	2012	2	4
Demography	Population	Rural/urban balance	Urban population	47	% of total population	2018	2	4
		Growth	Population growth	2.8	annual %	2018	1	1
Policy	Policy & regulation	Trade policy	Tariffs for agricultural products	13.9	Weighted average duty (%)	2018	3	3
	Production	Public budget	Public spending in agriculture	1.00	% of GDP	2017	3	3
	International aid	Agriculture	International aid flows to agriculture, forestry, fishing	2.40	% of GDP	2017	4	5
Governance	Governance & participation	Equity in land access	Large-scale land acquisitions	0.02	% acquired land/total land		2	

	Territorial balance	Well-being	Rural/urban gap of prevalence of stunting	10	% of difference	2017	3	
	Political stability/ conflicts	Displacements	Conflict-related displacements	18 000	IDPs in 2018 (stock)	2018	4	4
		Security	Political stability and no violence	-0.09	index -2.5 +2.5	2018	4	3
Infrastructures & technical services	Infrastructure	Electricity	Access to electricity	62	% of population	2017	3	1
	ITC	Mobile phone	Mobile phone access	104.5	subscriptions per 100 people	2018	4	3
Socio economy	Education	Level of education	At least basic education	40	%	2015	1	1
	Labour & equity	Employment structure	Underemployment in rural areas	4.9	%	2019	3	2
		Employment structure	Unemployed youth	43.8	%	2020	1	1
		Employment structure	Employed in agriculture	32	%	2019	2	4
		Labour productivity	Productivity of agriculture, forestry & fishing per worker	2 782	US$ /worker (constant 2010)	2018	5	2
	Income & equity	Poverty	Poverty ratio (national)	47	%	2011	2	1
		Income	GINI	40.3		2011	3	2
	Macro economy	Wealth & growth	GDP per capita	3 356	PPP US$ (constant 2011)	2018	3	1
		Wealth & growth	Percentage of agriculture, forestry, fishing	17	% of GDP	2018	3	4
	Trade	Import-Export	Cereal import dependency	56.2	%	2011 - 2013	1	1
Consumption environment	Affordability	Food prices	Food consumer price index (FCPI)	119.9	2010=100	2000 - 2019	5	5
		Food prices	Consumer price Index	107.3	2010=100	2000 - 2020	3	3
Food security, nutrition & health	Nutrition	Malnutrition	Share of stunting children	17	%	2016	5	3
		Malnutrition	Share of obesity in the adult population	7.4	%	2016	3	4
		Malnutrition	Share of anaemia among women	50.7	%	2016	1	
	Food security	Availability	Average supply of protein	58.7	g/cap/day	2011 - 2013	3	1
		Availability	Average supply of protein of animal origin	15.0	g/cap/day	2011 - 2014	3	1
		Availability	Share of undernourished people	11.3	%	2016 - 2018	3	3
		Affordability	Share of dietary energy supply derived from cereals, roots and tubers	61	%	2011 - 2013	3	1



BDoc Review of academic and grey literature and policy documents

✓ **Method**

A wide range of literature will be gathered in order to be able to cover the different dimensions of the analysis at national scale or with relation to specific segments of the food system (production, midstream, consumption) or to specific subnational areas. Academic and expert (grey) literature, and national and international/global reports will be scanned to identify those dimensions and food system components that are deemed critical at national level. Documents that need to be reviewed include policy documents, national strategies concerning agriculture, fisheries, rural development, food security nutrition and health, food safety, natural resources, climate mitigation and adaptation, risk prevention and resilience, employment etc., as well as but also analysis issued by professional organizations and civil society actors as well as multilateral organizations, research institutions and think-tanks.

In this task the consultants should also start gathering thematic maps regarding the four dimensions of sustainable food system (used at the end of step C).

✓ **Outputs**

This task is a cross-cutting. No specific outputs are expected since the literature review will inform the entire assessment. However, it will help in drafting the assessment report and policy brief, in particular the narrative parts. The policy dimension will be explored mostly through the literature review (as quantitative indicators on policies are scarce, and budgets are limited). Priorities regarding food system goals, as formulated in the literature and policy documents, will be identified.

BTren Characterizing key trends to identify system components that are likely to be affected

✓ **Method**

Based on existing time series and projections (when available), the trends and their implications for food system sustainability will be discussed. The length of the historical series will depend on the indicators, and the decision will be left to the judgement of the consultant (although it is recommended that the historical series start at least in 2000).

Trends need to be analysed with a systemic perspective, considering the overall conceptual representation (framework) of the food system and the interactions between the different components. Adding to the static picture of step 2Ind, the analysis of trends will point to issues that may worsen or become critical in the future.

Among food system outcomes it is worth considering:

- Trends related to food security, nutrition and health (e.g. prevalence of undernourishment, overweight, stunting)
- Trends related to socio-economics (e.g. employment in agriculture (total, female), % of population below the poverty line, dependence on imported cereals)
- Trends related to rural/urban territorial balance (e.g. rural/urban gap in the prevalence of stunting and per capita income)
- Trends related to the state of the environment (e.g. land use, GHG emissions resulting from agriculture).

Food system outcomes do not only depend on or result from what happens at the level of the food system and its activities. For example, the ratio of rural/urban household income may reflect industrial growth in urban areas, which increases the income gap. Therefore, the other sectors or factors leading to above-mentioned outcomes need to be specified.

Among possible drivers, the main trends that need to be considered are demographic, socio-economic, related to territorial balance, environment, political, changes related to consumption, as well as internal dynamics in the production and delivery or consumption environments.

See the list of indicators selected for trends and projections in Guidelines and Tools, below.

The selection was made considering the extent to which such drivers can affect a food system and alter food system activities in the long term. These drivers are expected to have a major influence on the future of the food system. They need to be discussed in light of the pressure they may exert on the core SFS goals.

The projections as regards key indicators provide information about the potential food system outcomes in a “business as usual” scenario. Projected data on food system indicators are relatively scarce, and those that exist are uncertain and built on a variety of assumptions. However, it is worth considering:

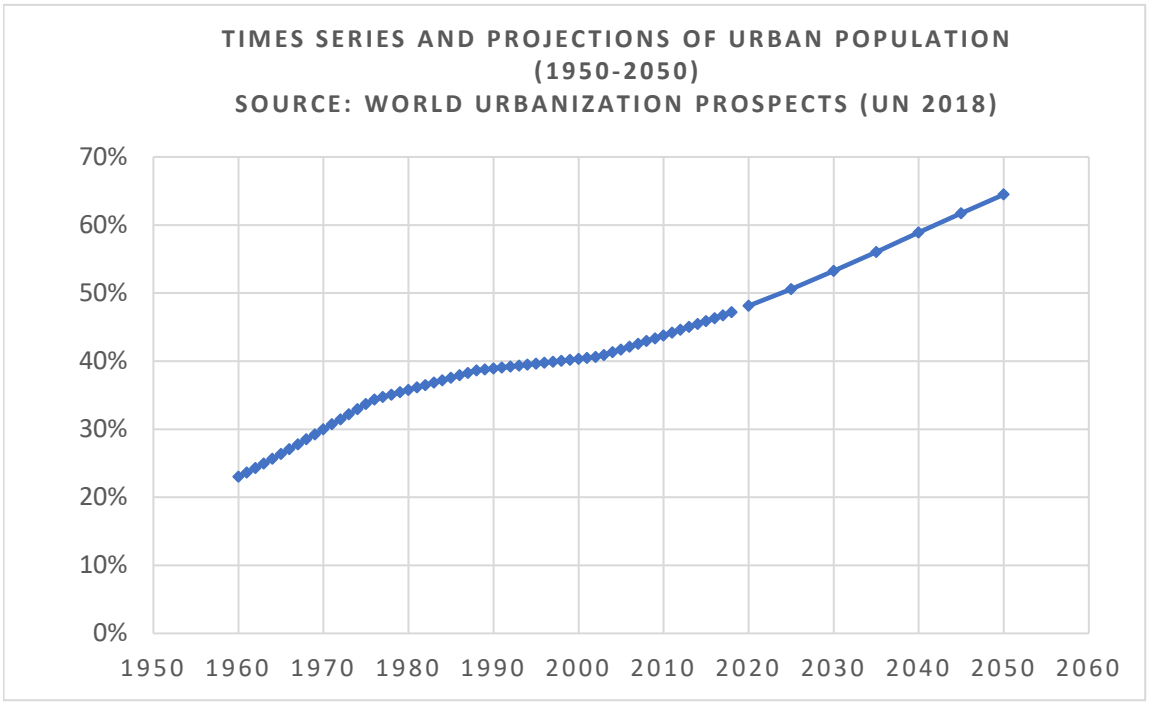
- food security, nutrition and health outcomes (e.g. malnutrition, obesity, diabetes)
- socio-economic outcomes (e.g. employment in agriculture, evolution of the food production index).
- demographic drivers (e.g. population growth, urbanization) and related consumption
- environmental drivers (e.g. rainfall, temperature, hazards).

✓ Outputs

The main outputs of this task will be presented in graphs and/or in narrative form, on the major challenge/problem itself or the causes that may worsen aggravate the situation. They will address the following questions: How have food systems performed in the last decades relative to the four core SFS goals? Which trends are currently affecting food systems actors and activities? Which drivers present the most worrying trends and forecasts for the future sustainability of food systems?

Box 3. Time series and projection (example using data from Senegal)

The graph below represents the times series and projections of the proportion of urban population (1950–2050) in Senegal. The data come from the World Urbanization Prospects (United Nations). By 2025, more populations will be urban than rural in Senegal, which will permanently affect how the food system functions. Indeed, urbanization reduces agricultural production for self-consumption, changes dietary composition (more animal products and processed foods) and increases out-of-home consumption. These patterns will result in changes in all food system segments to enable an adequate supply of food for the growing urban population.



✓ Guidelines and tools provided for tasks BInd, BDoc and BTren

[B IND_TREND_BAL - INDICATORS Selection.xlsx] Table of the selected quantitative indicators, per dimension, subdimension and category. Essential information is provided for each indicator in this global table:

- The dimension, subdimension and category of the indicator
- Whether the indicator is used for task ASh, task BInd, BDoc and BTren
- Whether the indicator is considered as "Primary" or "Secondary". Primary indicators are those that must be explored either quantitatively (if data are available) or qualitatively. Secondary indicators must be documented if the given dimension is particularly critical to meet the SFS goals in the context concerned by the assessment.
- Its relevance as regards: outcome, impact and/or driver
- The scale of relevance of the indicators (some will be also used for the territorial analysis, for task
- The sources of the data

- The suggested group of countries to be used for cross-country comparisons and scoring (e.g. LICs/LMICs or world).

[B IND_TREND_BAL - Indicator sheets.docx] Individual indicator sheets provide details for each indicators: definition, rationale, range of value, unit, limitations, comparisons/scoring indications, alternative indicator if not available, main sources of data and references for more information.

[B IND_TREND_BAL_Narratives.docx]: List of websites and types of documents that can be exploited in the eight dimensions: environment, socio-economy, territorial balance, demography, policy, infrastructure and technology, production and delivery environment, consumption environment, food security, nutrition and health. Key questions are suggested for each dimension.

[B IND_TREND_BAL - Database_Availability per country.xlsx] List of main relevant international databases or websites and coverage per country.

[B IND_TREND_BAL - Detailed websites.docx] Key international websites or databases to consult, with a short description of the available data and the leading organization.

[B IND_Calculated indicators LMIC-LIC.xlsx] [2_IND_Calculated indicators All countries.xlsx] Files with some of the main indicators (required in the rapid assessment or in task 0Sh of the extended assessment) per country, including quintiles for LICs/LMICs and for the world. These files will facilitate both the collection of the indicators and scoring.

[B TREND_Projections_Sources.xlsx] Main sources containing data projections with the corresponding methodological fundamentals.

[B TREND_Times series&projections.xlsx] Selection of time series and projections, documented for the case of Senegal.

Task B Bal: Food balance and essential insights as regards main agricultural products

✓ Purpose

To provide essential insights for the main food products and important non-food agricultural products at national scale. The aim of this task is to provide a global view of the relative share of the products and the balance between the domestic and world markets.

✓ Method

This task consists of documenting statistics on the main crops, animal products and non-food products (production, exports, imports) at national scale and the balances for the main categories of food products, based on FAOSTAT.

Balances per commodity groups and strategic food products can be extracted from FAOSTAT (expressed in calories, proteins, fats and oils). The range of foodstuffs to be explored in the food balance analysis is left to the judgement of the consultant, but some suggestions are provided in the guidelines below. FAOSTAT does not provide direct data for the total food balance, but it can be calculated. Some calculations based on FAOSTAT are suggested in the indicator sheets and illustrated with the case of Senegal.

✓ Outputs

- Charts and narratives answering the following questions: How is the diet structured (product groups, calories/protein/fats and oils)? Which food products are most consumed (in quantity and/or in value)? What are the most produced food and non-food products? What (and how much) is exported/imported? To what extent does the country depend on imports to cover its needs? What are

the long-term trends? What is the total food balance and the balances for the strategic food products or categories of food products?

- A short narrative will present the contribution of non-food agricultural produce (and value chains) to food system components: mains products, share of land, production value, and exports.

✓ Guidelines and Tools for task B_Bal

[B BAL - Guidance for selecting strategic products.docx] Criteria to choose the key strategic products.

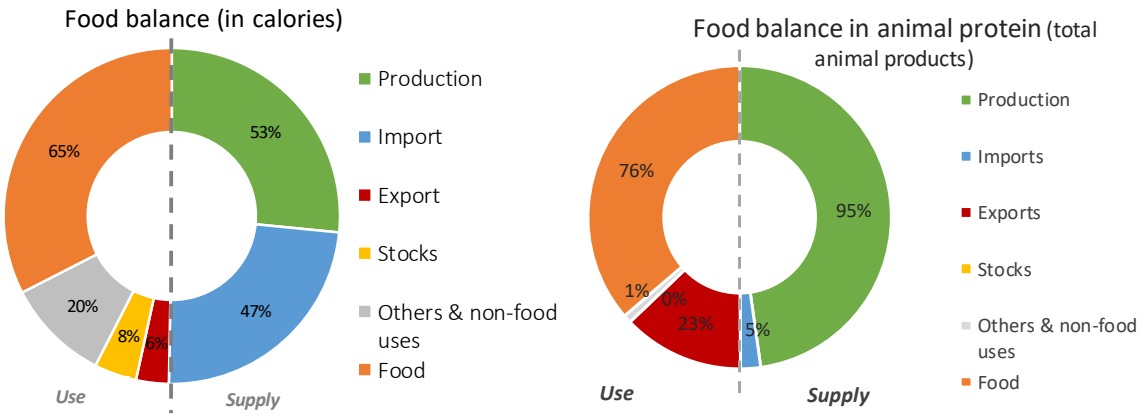
[Indicator sheets.docx] Individual sheets for each indicator provide more details to enable calculation of the food balance.

[B BAL Senegal_FoodBalances.xlsx] Data and calculation of food balances based on the example of Senegal.

Box 4. Food balance – the case of Senegal

The food balance in calories can be calculated using FAOSTAT data. This makes it possible to identify dependence on imports as well as the diverse use of food calories. This kind of food balance should also be calculated for the key categories of foodstuffs, i.e. cereals, animal products and vegetables.

See more examples in [B BAL Senegal_FoodBalances.xlsx]



3.4 Step C: Stakeholders' and experts' qualitative appraisal and spatialization

✓ Purpose

- To enrich the data-driven insights on food system performance, priorities and challenges with qualitative appraisals by stakeholders and experts in the different domains
- To explore the diversity of existing situations in terms of combinations of food systems' challenges, opportunities and dynamics across the country
- To characterise and map the main types of actors and activities of each segment of the food system – major non-FS actors that influence the FS.

✓ Rationale

Although the national overview of the most pressing challenges is crucial, it can easily overlook the spatial heterogeneity. Different subnational territories are most likely a product of different trajectories and hence face different realities and combinations of challenges relating to their food system. Each territorial food system will also involve different actors, deploying their activities differently and developing different innovations and internal dynamics, all of which lead to specific combinations of outcomes.

A deeper understanding of territorial characteristics and constraints will not only facilitate the identification of priority issues, but also trigger collective commitment to search for a sustainable pathway for sustainable food system transformation based on a systemic vision of food systems. This analysis at subnational scales provides information on the diversity of the required responses to the specific combinations of challenges.

The tasks in steps C and D aim to meet this objective of collective commitment. This will be an iterative process since the shared learning that occurs in step D will also trigger further sharpening of boundaries of the territorial food systems pre-identified in step C as well as their more detailed characterization.

The step C is composed of three types of tasks: Tasks C_Typ, C_Int and C_Ana.

Task C_Typ: Overview of food system actors and activities at national and subnational scale

✓ Objectives

The aim of this task is to provide a primary overview of key food systems players in each segment, from production to consumption, as well as other significant non-food or non-agriculture actors and activities that have a major influence on the FS.

The national typology will be discussed and consolidated during a specific task force, gathering 10 to 14 resource persons. The aim of task C_Typ is to prepare the task force session, in order to propose a selection of criteria to characterize each segment and a preliminary typology of food systems actors.

✓ Method

This task C_Typ is composed of two parts.

The first one consists of desk work to provide a preliminary typology. This task is mostly based on the consultants' knowledge, completed by the literature review.

The second part consists of a task force gathering a group of 10 to 12 key resource people, that together have a good knowledge of about every region of the country and every function of FS. They should propose synthetic map that depict the main actors and activities in the FS (as well as non-food or non-agricultural actors). For this mapping part, existing maps of production systems or livelihoods can also be used (e.g. Livelihood Zones, FEWS NET).

Main types of actors to be considered in this task:

- The main food system actors with their respective groups of activities along the food chains: production, aggregation/transport, processing/packaging, distribution of food products that originate from agriculture, forestry or fisheries, and management of waste/co-products.
- Major actors and activities in non-food agriculture sectors (e.g. cotton, palm oil, coffee, cocoa) in so far as they interact with food systems, especially in terms of land use, access to inputs, farmer or interprofessional organizations.
- The main non-agricultural activities (e.g. tourism or mining) that significantly influence food system should also be mentioned. These non-agricultural activities will be probably link with one specific area and interact with food systems (e.g. rise in food or labor demand).

Concerning producers, the national agricultural statistics will be used to identify the main structural features of farms and their activities. Existing functional typologies in literature will also be explored, either at national or local level. Four types of criteria for describing FS actors and activities are recommended. They are mostly qualitative: structural features, main activities, technological aspects and farm practices (production technologies, irrigation, mechanization, fertilization, and soil management), as well as market relations and governance dimensions (farmer organizations, value chain governance, spot transactions, inter-linked transactions or contract farming). We suggest avoiding describing producers only using their main agricultural production because most are diversified.

Midstream segments (aggregation, transport, processing, and packaging) are often "black boxes" for which very few data are available. This is partly because many food system actors of these segments remain informal. Information will be collected through a review of the literature and interviews with key informants (Task 3Int). Similar to what is done for the producers, the characterization of the main types of midstream actors and activities will be based on main activities/products, structural features (e.g. number of units, average size), the kind of labour force, technologies and management process (e.g. cold chain, energy use) as well as governance structures (e.g. existence of interprofessional or professional organizations, value chain governance). While producers are often not only associated with one particular food product, the reverse is true of actors in midstream segments, who frequently specialize in only one product or a combination of related products. These actors can consequently be best identified through their relationship with specific groups of products. The choice of these products and value chains should be made with regards to their contribution to the four SFS goals, notably:

- Relevance for food consumption (nutritional relevance or quantities consumed)
- Environmental relevance (e.g. in terms of preserving/consuming renewable/non-renewable natural resources, cause of conflicts related to resource use)
- Socio-economic relevance (e.g. involving many producers, providing many jobs, lucrative jobs (also for the State through taxes, exports and access to foreign currency), dynamic/innovative (value chains), political relevance (e.g. products targeted by key policy strategies, political economy considerations).

Activities connected with waste management will also be described, building on interviews with key informants and the literature review (see [B IND_TREND_BAL_Narratives .docx]).

Regarding to consumption segment, one can consider some consumers structural features (e.g. urban life style, purchasing power), consumption practices (e.g. specific cultural habits), dietary diversity and the prevalence of self-consumption.

✓ Outputs

The output of the first part (desk work) will be a table gathering the following information:

- the 'name' of the type (the name should be concise and simple)
- the main characteristics according to the various criteria (alternative criteria can be used if more relevant)
- whether or not the type is specific to one particular area.

Up to 5 "types" by segment should be identified and characterized.

The output of the second part (task force) is a food system actors and activities mapping, according to the zones identified after the interviews, as relatively homogeneous in terms of the main FS issues and drivers. This synthetical map will then be digitized, to use as a base of discussion and mapping during the interviews (C_INT) and after refining, to be presented and discussed during the synthesis workshop (step D)

✓ Guidelines and tools

[C TYP – Characterising and spatializing the main FS actors and activities.docx]

Task C_INT: Overview of food system actors and activities at national and subnational scale

This task will be achieved through a series of individual interviews with key informants who may have different visions of the challenges faced by food system to meet sustainability goals.

✓ Objectives

Key informants' interviews aim to enrich the general overview on challenging outcomes, and drivers with qualitative appraisals by stakeholders and experts of the different dimensions / sub dimensions. This is also expected to explore the diversity of situation across the country.

Most of the informants should have attend the kick-off meeting. However, additional relevant stakeholders and resource persons can be added to the analytical process at that stage. The experts should select key informants able to describe/identify food systems and related transformation processes playing out at national scale and/or in a specific territory. Who these key resource persons are will depend on context and dimensions of the food system. Guidelines are provided to help selecting the right people to be involve in the participatory process. Altogether, the interviewees should have knowledge in all the sub-national region of the country. The initiator of the assessment will facilitate this selection.

As a team, the experts should conduct around 20 interviews. Which expert should conduct which interview should be based on each one's field of expertise.

Order of interviews

It will be important to start with people with a wide vision of FS issues and FS functioning. After a few interviews (around 5), consultants should meet and confront their results from interviews. The objective of this brainstorming is to make an intermediate synthesis. People with more specific/technical skills and knowledge about one of the key issues will be interviewed in a second time to complement the intermediate synthesis.

Preparatory task

During the kick-off workshop, participants will be asked to identify the main causes of FS' problems/challenges to reach sustainability impacts in the four dimensions. Building on this "raw" material and the literature review, the consultants will prepare a draft impact pathway table, by main problem. The tool [C ANA - Interactions.xlsx] can help identifying key interactions between FS components (in addition to the causes pre-defined in step A). This table will be the support of this third part of the interview.

The interviews should focus on the following points (to be adapted to the category and domain of competence of the interviewee):

- Introducing the discussion (quickly for the interviewees who have attended the kick-off meeting) by presenting the aim of the analysis, the rationale of the SFS approach, a brief description of the conceptual framework, the main steps of the analytical process and the specific objective of the interview, which are:
    - To detail some of the main problems / challenges and discuss the processes linking them to FS actors and activities and/or to FS drivers.
    - To elaborate schematic maps on the spatial distribution of challenging outcomes and drivers.
- Deepening the short list of the main challenges/problems identified during the kick-off meeting and map them. For each of these challenges/problems (in the four dimensions of FS impacts): discuss their geographical (or population) scope and temporality (eg. already issue at stake that will become very critical in the future)
-
- Focusing on the problems / challenges that are in the area of knowledge of the interviewee, elaborating the impact pathways that leads to the main problems discussed previously to their main causes (based on the prepared table). The causes can consist of drivers or some specific FS actors or activities (core system). Three maps will be gradually filled in, while discussing each problem/challenge:
    - A map of the problems / challenges under discussion
    - A map of the drivers that are related to the challenge under discussion.
    - Additional elements on the actors map (elaborated by the task force) to localizing those related to the challenge under discussion

- If documents or sources of information on the main challenges were missed in the preliminary literature review, ask for additional references. If key resource persons are missing to cover the all range of main problems, recommendations can also be asked.

✓ Outputs

- The table prepared by a desk preparatory work is complemented by interviewees qualitative appraisal. All qualitative information that illustrate the impacts pathways and overall analysis of FS sustainability in the short and long term is synthetized.
- Three maps are simultaneously prepared during the interviews: one about the main challenges/problems, one about the drivers that influences the key challenges/problems, one about the FS actors/activities identified as linked to the key challenges/problems.

✓ Guidelines and tools

[C INT - Guidelines to choose informants to be interviewed.docx] Category of informants to interview and criteria for selecting them

[C INT - Interview guidelines 09.09.docx] Interview guidelines

[C ANA - Interactions.xlsx] Matrix of possible interactions between drivers and activities; Matrix of mutual interactions between drivers; Matrix of the possible interactions between activities and outcomes/impacts; Matrix of possible feedback loops from outcomes to drivers.

Task C_ANA: Initial delineation of territorial food system boundaries and characterization of territorial food systems

✓ Objectives

- To identify a relevant scale where food system's challenges can be further explored and taken up.
- To document territorial food systems profiles

✓ Methods

Based on the spatial distribution of the main FS challenges, their related drivers and FS actors and activities, the consultants will roughly identifying zones (i.e. territorial food systems) where food system actors face similar combinations of challenges and related causes that jeopardize the achievement of core SFS goals as well as in which food systems activities and dynamics are relatively homogenous.

To do so, the consultants will use several maps:

- Thematic maps gathered from the literature (e.g. food insecurity maps, land use, maps of climate change related risks…)
- A main actors and activities map that come from the task force Typology
- The corpus of maps that come from individual interviews that depict the spatial distribution of the main challenges/problems
- The corpus of maps that come from individual interviews that depict the spatial distribution of the major drivers that influence the challenges/problems
- The corpus of maps that come from individual interviews that depict key FS actors and activities that influence the challenges/problems

The initial delineation of territorial food system boundaries will result from the joint analysis of the consultants, based on the materials presented above. They will "superpose" the different maps depicting the spatial distribution of the relevant food system components. By simultaneously looking "across" the distribution of the selected food system components and combinations of challenges, the consultants will be able to spot homogeneous units. The consultant can also build on pre-identified criteria to define the boundaries of territorial food systems, such as food flows.

In order to make the territorial food systems' profiles, the consultants should build on the interviews as well as subnational quantitative and qualitative data. The process resembles the one used in step B at national scale. Spatial differentiation of quantitative indicators, narratives and trends can be used to provide an overview of key "facts and figures" of each territorial food systems[3]. This will provide a first presentation of

[3] The scale will depend on the granularity of the data available to describe/approximate food system dimensions. Not all data will be provided at the same scale. For instance, while food security and educational indicators are often based on administrative spatial breakdown (regions/departments), environmental outcomes or trends are often available at the level of (wide) agro-ecological zones.

how the identified territorial food systems actually operate and perform (in relation the short list of key FS challenges in the four dimensions of SFS), and how they are shaped by drivers and/or FS actors and activities.

Both the initial delineation and descriptions of territorial food systems will be further assessed and refined in a participatory process involving stakeholders and mobilizing expert knowledge (step D).

✓ Outputs

Preliminary map of territorial food systems in the country under study as well a preliminary narrative to describe these pre-defined zones

✓ Guidelines and tools

[C ANA - Criteria to define territorial food system boundaries.docx] A list of pre-identified criteria to define the boundaries of territorial food systems (which could range from main flows of products, to socio-political, economic, agro-ecological or cultural criteria).

[C ANA - Sources of maps.docx] Sources of maps on administrative boundaries, agro-ecological zones, livelihoods, etc.

Sources of data, list of websites and documents to be consulted (see Guidelines and tools provided for tasks B Ind, B Doc, B Tren).

3.5 Step D: Sharing, discussing and reaching a shared understanding on spatially differentiated food system analysis

✓ Purpose

- Achieve broad and shared understanding on key current and future challenges to achieve sustainable food system goals (SFS) at national and subnational/territorial levels
- Facilitate dialogue among FS stakeholders, policy makers and (local) authorities, to co-construct a multidimensional and dynamic vision of FS and to identify critical points and opportunities for interventions

✓ Method

This task will be achieved through a one-day synthesis workshop bringing together people who have already been interviewed and participated in the kick off workshop, and eventually newly identified food system experts and stakeholders. The synthesis workshop may involve an audience up to 40 participants.

The workshop will consist on both plenary and working group session and will cover the following topics:

Plenary session: Presentation of the main intermediate conclusions at the national level resulting from the diagnosis: for each of key FS challenges/problems that jeopardize FS to have positive impacts in the four dimensions of SFS in the shortlist, the consultants present the key facts and figures. The consultant should format and present the results using the most meaningful information in the given context. This selection is expected to be determined by both the red/green flags obtained from the quantitative assessment (i.e. whether the country performs very well or very badly compared to LIC-LMIC countries or worldwide), and by the national informants' perception of the most pressing challenges. The consultants should be careful

in presenting such insights in a systemic and dynamic way, presenting the causal relations between food system components. The content of the presentation comes from step A to C.

Working group session: Territorialisation of the FS challenges. Based on step C (task C_Int, C_Typ and C_ANA), the consultants will present a proposal to break down the country into a set of subnational territorial food systems. By describing each zone, the consultants should emphasize the systemic feature of territorial food systems to enable participants to grasp the system's multidimensionality, to understand the interactions between food system components (in particular the impact pathways that link key FS challenges to their causes) and to understand some of the trade-offs between system outcomes but also to acknowledge some of potentials for food system to contribute to a wide range of SDGs. This preliminary mapping is further discussed collectively during the synthesis workshop.

Will be discussed:

- delineation of territorial FS
- profiles of FS
- the entry points/leverages to be favoured in order to achieve sustainable food systems in the 4 dimensions. These entry points can consider both national and territorial scale (priority areas where challenges are particularly pressing or have determining influence at national level on reaching core SFS goals) as well as priority dimension which could be appropriate levers to trigger transformative change and have cascading effects on different dimensions of SFS goals.

Territorial food systems that pose particular challenges (e.g. in terms of equity or security) could well become national priorities. Some drivers or major actors may also be identified as potential transformative levers to build pathways towards SFS goals.

- ✓ Outputs

From this synthesis workshop the expected output is to agree on:

- a synthetic mapping presenting the division of the national territory into territorial food systems (or a very limited number of cartographies if there are divergent visions by groups of actors)
- a coherent narrative of the main actors and activities, the main current and future challenges and their causes (related to the functioning of the FS or the drivers affecting the FS) within each area ("territorial FS profiles"). This is not expected to draw a systemic model based on the generic conceptual framework (see figure 1), but the territorial FS profiles should be described in a systemic and dynamic way, building on the various dimensions of FS driver and impacts and the interrelations between FS components (see figure 1), as well as the impact pathways that link the key challenges to their causes
- Few entry points or levers to be activated to improve the sustainability of food systems at the territorial level.

- ✓ Guidelines and tools

[A_SH C_INT D_SH - Guidelines to choose process participants 11 09.docx] Guidelines to choose which people to get involved in the workshops

[D -Synthesis workshop guidance -draft 08.09.docx] Guidelines to lead the workshop

3.6 Step E: Synthesis of the food system analysis at national and subnational scale

Purpose

- To provide a holistic, systemic and spatially differentiated summary of the analysis

✓ Method

This task will consist of aggregating the information collected in all the interviews, workshops and from the review of data and literature, and formatting the results.

✓ Outputs

The following outputs combine the most relevant results obtained from the previous tasks:

- Synthesis report
- Policy brief
- Power point presentation (made for step D and improved if needed after the discussions)

The following inputs will include the following information:

- Key messages and summary representations for the short list of key challenges/problems that jeopardize FS to have positive impact on the four dimensions of SFS. This include: trends in drivers and outcomes at risk, as well as those with a positive evolution; key data and insights on strategic food and non-food products that significantly shape food systems (production, consumption, imports/exports, food balances); a general picture of the different types of actors involved in the food system (in terms of numbers or in their share of the market); the facts and figures relative to the problems' causes
- The outputs generated by step D: a synthetic mapping, a coherent narrative for each territorial FS profiles, few entry points or levers to be activated to improve the sustainability of food systems (see above).

✓ Guidelines and tools provided

[E WRI - Policy Brief_Rapid.pub] Draft outline of the policy brief.

[E WRI - Double page_Extended_Territorial FS.pub] Outlines for briefs territorial scales.

[E WRI - Deliverable Country Report Outline.docx] Full report outline.

Conclusion

Food systems are directly linked to the achievement of more than 12 of the 17 SDGs. The imperative – and the challenge – for food systems is not only to produce food to assure food and nutrition security, but also to contribute more broadly to building a sustainable planet and sustainable livelihoods for all in the long term. The inclusiveness, resilience and sustainability of food systems are critical levers to address this challenge.

Assessing the performance of food systems at national and subnational levels, along with the risks and challenges they face, is crucial to fully understand and maximize their contribution to the SDGs. For such an assessment, political, economic and social actors, including the research community, need to collaborate to co-assess current food systems, identify the available alternatives to transform them, understand the weight of the inevitable trade-offs, and steering food systems onto a sustainable pathway.

The aim of the assessment methodology proposed here is to help develop an initial systemic, broad and multisectoral understanding of the national and subnational food systems, identify the current and future challenges to their sustainability, and begin to determine the priorities for system-transformative actions and investments.

Compared to existing methodological frameworks, the added value of this methodology is twofold. First, it should be capable of providing a comprehensive narrative on system challenges and transformative opportunities, with quantitative evidence and qualitative analysis based on robust participatory assessment processes. Second, subnational food systems will be characterized by the commonality of the challenges that territorial stakeholders are facing as well as the opportunities for sustainable and inclusive transformation. By highlighting challenges and opportunities at the territorial level, the methodology seeks to guide discussions on priorities and sequencing of interventions and programs to improve the sustainability of food systems.

The proposed methodology will enable food system stakeholders to acquire a shared understanding of the challenges, the risks and the opportunities present in food systems that are coherent and homogeneous. But it does not go as far as the formulation of concerted strategies or action plans. Before that can happen, agreement will have to be reached on common objectives and possible futures that will then allow the territorial food system to improve its resilience and sustainability. For both rapid and extended assessments, if improving the sustainability of food systems in the country proves to be an important lever for achieving short- and long-term development objectives, an in-depth participatory assessment of territorial food systems will be essential to select interventions (and corresponding investments) that are capable of putting the system on a sustainable trajectory. This will require a deeper analysis and collective reflection, involving territorial food system stakeholders, in order reach at a vision of their future food system and to propose pathways to achieve the transformative changes that are necessary.

This national and subnational assessment methodology is the first step towards the adoption of transformative trajectories that will maximize the potential of food systems to achieve many of the SDGs.

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Appendixes

Appendix 1. Concepts and definitions

Concept	Definition
Actors and activities	The notion of actors and activities encompasses the entire range of actors and their interlinked activities along the food chains – : production, aggregation, processing, packaging, transport, distribution, management of waste/co-products, consumption, preparation and disposal of food products – that originate from agriculture, forestry or fisheries. This component is also referred to as the ""core system" or "nucleus of the system".
Challenges	The challenges are outcomes, impacts or drivers of the food system that threaten the sustainability of food systems. Challenges may refer to either already critical situations, specifically when linked with negative feedback loops between outcomes and drivers, or (a combination of) trends that create risks for food system sustainability and future capacity to meet their core goals.
Components	Five components make up food systems: (i) drivers;, (ii) production and delivering directproximate environments;, (iii) consumption environment;, (iv) food chain actors and activities;, and (v) outcomes and impacts.
Consumer behaviour	Consumer behaviour "reflects the choices made by consumers, at household or individual levels, on what food to acquire, store, prepare and eat, and on the allocation of food within the household (including gender repartition, feeding of children)" (HLPE 2017). Consumer behaviour is influenced by personal preferences and the food environment.
Consumption environment	Beyond endogenous vs exogenous and intended vs unintended drivers, we also consider the direct/proximate (vs indirect/overall) factors that influence food system actors. The consumption environment is considered as the proximate environment of consumers. Keys elements are: availability and physical access in proximity; diversity; affordability; promotion/ advertising/ information; labelling; and product safety and quality. This environment derives from activities in the production and mid-stream segments, as well as political and infrastructure drivers.
Core sustainable food system goals	Food systems are expected to contribute to core goals in four dimensions: (i) food security, nutrition and health dimension; (ii) socio-economic dimension; (iii) territorial balance; and (iv) environmental dimension (see section 4.0).
Core system	See "actors and activities"
Dimension / Sub-dimension / Category	The term dimension is used to characterizse different types of drivers, outcomes and impacts. Nine dimensions are used for drivers and/or outcomes/impacts: environmental; socio-economic; territorial balance; demographic; policy-making; infrastructure and technological; production and delivery environment; consumption environment; and food security, nutrition and health. Each dimension is divided into several sub-dimensions, which in turn are broken down into several categories, in which one or more indicators of drivers, outcomes or impacts can be found.

Drivers	In the literature, the notion of "driver" has diverse meanings. While some authors only consider drivers as external factors (Walker 2012), others extend the definition of drivers to internal driving forces. The conceptual framework considers both external (e.g. climate change) and internal drivers (e.g. agriculture subsidies). In addition, the distinction between intended or unintended dimension of the dynamics that may drive food system activities (made by Béné, et al. 2019) is crucial when it comes to helping policy makers to make transformative policy decisions. Intended internal drivers include internal dynamics of the actors and the innovations they undertake. Drivers are the "endogenous or exogenous processes that deliberately or unintentionally affect or influence a food system over a long -enough period so that their impacts result in altering durably the activities, and subsequently the outcomes, of that system" (Béné, et al. 2019). Here, we classify drivers in six dimensions: biophysical and environmental; demographic; territorial balance; infrastructure and technological; socio-economic; and policy-making.
Feedback loops	Feedback loops are circular effects between the impacts generated by the food system and the drivers that influence it. It is notably the case of environmental, socio-economic, and territorial balance dimensions, which both influence and are affected by food systems.
Food Security	"Food security, exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability", as defined by the Committee on World Food Security in 2017 (http://www.fao.org/cfs/OnlineGSF/en/).
Food system approach	The food system approach involves departing from traditional approaches which either tended to be sectoral with a narrowly defined focus and scope, or which use systemic thinking, but are limited to segments of the food chain (for instance, a production system). It addresses these limitations by taking a holistic and comprehensive view of the broad range of actors of the food system and of the governance mechanisms that shape their activities. This approach includes a focus on "the full range of interactions, feedbacks and trade-offs rather than on characteristics of separate pieces of the system" (Béné, et al. 2019).
Food system boundaries	Food system boundaries delineate a geographic area within which the actors and activities and the combination of goals and challenges/opportunities are homogenous/consistent.
Food system performance	Food system performance refers to the food system outcomes and impacts, in terms of progress towards the core sustainable food system goals.
Food system stakeholders	Food systems stakeholders are direct actors of the systems (producers, fishers, collectors, traders, processors, distributors, and consumers), leaders of professional organisations, NGOs and others civil society organisations, local authorities, policy makers, international and regional organisations and donors related to food systems.
Non-food agricultural sector (or products)	The non-food agricultural sector includes the actors and activities involved in the production, co-product/waste management, processing and trade of products that originate from agriculture, forestry or fisheries, but that are not used to feed people. This sector includes livestock feed, exported high value-added spices or beverages (e.g. coffee, vanilla), fibres (e.g. cotton), materials used to produce energy (biofuel from soy), and wood.
Non-food sectors or systems	The non-food sectors are the sectors that are interconnected to agricultural and food activities such as energy, health, labour andor trade sectors (FAO 2018a).
Nucleus of the system	See "actors and activities"

Outcomes and impacts	"Outcomes" and "impacts" refer to two distinct levels in the impact pathway. Building on the Glossary of Key Terms in Evaluation and Results Based Management published in 2010 and adapting the definitions to the analysis of food system, "outcomes" are defined as the short-term and medium-term effects that result from the food system. "Impacts" refers to all the primary and secondary long-term effects produced by the food system. Both outcomes and impacts may be intended or unintended, positive and negative (OECD 2010). As differentiating between "outcomes" and "impacts" is often tricky, in the following methodology, we mostly use the term "outcomes" to refer to the different effects generated by food systems (although long-term effects are also included).
Personal determinants of food choices	Personal determinants include preferences, values and skills, time and lifestyle, purchasing power, household size, and age.
Production and delivery environment	Beyond endogenous vs exogenous and intended vs unintended drivers, we also consider the direct/proximate (vs indirect/overall) factors that influence food system actors. Production and delivery environment refers to the directproximate financial and technical services that influence actors and activities from food production to distribution. The production and delivery environment is the proximate environment of actors from production to distribution.
Segments (supply chain segments)	A segment comprises actors who provide the same range of functions in the supply chain. We distinguish between the production segment, the consumption segment, and, depending on the cases, several the mid-stream segments: aggregation and transport, processing and packaging, storage and distribution. Waste/co-product management is also considered as a specific segment.
Subnational scale	The subnational scale is a lower scale of analysis than the country scale. Depending on the granularity of the data available, the degree of detail of the analysis will vary.
Sustainable food system	A sustainable food system is one that achieves the four core goals in four main dimensions (nutrition and health, socio-economic well-being, environmental quality, and territorial balance) in such a way that the economic, social and environmental bases needed to reach these core goals in the future are not compromised.
Territorial food system	A territorial food system is a specific food system (at a sub-national scale) characterized by a specific set of actors and activities and a relatively homogeneous combination of goals and challenges.
Trends	Trends are the prevailing tendencies of either drivers or outcomes that durably affect or result from food systems. They result from series of historical data and forecasting. The easiest to predict and the least uncertain are environmental, demographic and socio-economic trends (Benjebbar and Bricas, 2019, chap 1.3.).
Type of actor	Within a specific segment, a "'type of actor"' refers to a subcategory of actors who operate in a relatively similar way and context in terms of different possible criteria such as capital endowment, technology, access to services and markets, or organisation.

Appendix 2. Tasks and timeline for the 'Extended Assessment'

Type of task	STEP 1 -- Frame the issues	STEP 2 -- Document the food system challenges and opportunities at national scale	STEP 3 -- Conduct qualitative appraisal	STEP 4 -- Share and discuss preliminary results at national scale	STEP 5 -- Identify and characterize territorial food systems	STEP 6 -- Share and discuss territorial food systems, agree on a shared understanding	STEP 7 -- Summarize main results
Indicators		2Ind			5Ind		
Documents		2Doc			5Doc		
Trends		2Tren			5Tren		
Food consumption/ production/ balance		2Bal			5Bal		
Types of food system actors		2Typ			5Typ		
Interviews			3Int				
Analysis				4Ana	5Ana		
Share	1Sh			4Sh		6Sh	
Write					5Wri		7Wri

Objective of the step	Objectives of the tasks	Tasks	Method to be used for each task
STEP 0 [Prepare]*	To select national experts To become familiar with the methodology To prepare the initial workshop		*Identify, select and recruit national experts* *Train the national experts (by CIRAD and FAO experts)* *Identify and invite workshop participants; identify informants to interview*
STEP 1 [Consulting] Frame the issues	To bring in/involve key stakeholders in a joint assessment process and agree on the main steps To specify/requalify the four core sustainable food system goals in function of national specificities (to focus on key challenges, or the population group most concerned, or subnational areas) and to target the most pressing issues in order to frame the assessment according to local specificities	1Sh	*Conduct rapid review and synthesis of data and policy documents* *Hold kick-off workshop with key stakeholders and brainstorming session*
STEP 2 [National entry] Document the food systems challenges and opportunities at national scale	To have an overview of the multiple dimensions affected by the food system (outcomes) and those that are shaping food systems evolution (drivers) at national scale To identify pressing challenges (current or in the coming decade) related to these outcomes and drivers	2Ind	*Quantitatively document current food system drivers and outcomes at national scale. Using a scoring method based on LIC/LMIC distribution of values, pre-identify the challenging outcomes with regard to the four core sustainable food systems goals*
		2Doc	*Qualitatively document food system components through a review of academic and non-academic literature and policy documents*
		2Trend	*Characterize key trends (forecast based on historical data and projections, when available) at national scale; identify critical trends with regard to sustainable food system goals*
	To provide an overview of production, consumption and other uses of agricultural production To provide a global overview of the relative share of production and of the balance between the domestic market and world market	2Bal	*Document the statistics on main food and non-food products (production, exports, imports) at national scale and the food balance for the main categories of food products, including in calories*
	To provide an overview of food system actors and activities at national scale	2Typ	*Characterize the types of food system actors and activities, per segment*

STEP3 [Interviews] **Conduct qualitative appraisal of spatially differentiated main challenges and opportunities of the food system**	To enrich the desk assessment of performance, priorities and challenges with qualitative appraisals of stakeholders and local experts To explore the diversity of situations across the country (elaborated in step 4Sh) To provide qualitative information on main actors and activities in each segment of food system and related non-farm activities	**3Int**	*Conduct a series of individual interviews with key informants in:* *- Food security /nutrition and health* *- Environment and natural resources* *- Poverty, employment, livelihoods* *- Midstream segments and markets* *- Stability, risks, territories and governance issues*
STEP4 [Consulting] **Share and discuss preliminary results at national scale**	To provide a summary of the drivers, outcomes and trends of the food systems at national scale, including quantitative indicators and qualitative appraisal, in a multidimensional perspective	**4Ana**	*Aggregate the information gathered in interviews and from the review of data and literature, and format the results*
	To raise the awareness and reach a shared understanding among stakeholders on the rationale for adopting a multidimensional, systemic vision of the current and future challenges to meet the sustainable food system goals To reach a shared understanding of key current and future challenges to achieve core SFS at national scale To refine the main types of food system actors and activities across the country	**4Sh**	*Organize a workshop to present the results (of steps 1, 2 and 3), discuss the performance assessment and validate the key challenges to achieve core SFS goals at national scale*
STEP 5 [Spatial distribution] **Identify and characterize territorial food systems**	To identify the spatial distribution of food production areas and consumption centres, and food-surplus and food-deficit areas	**5Bal**	*Map the production areas and consumption centres for the main categories of food products*
	To identify the different types of actors and activities and their spatial distribution, and possible interactions with non-food and non-agricultural activities	**5Typ**	*Document types of actors and activities on a subnational basis, and map them across the country (including non-food and non-agricultural actors and activities, if they significantly interact with food system activities)*
	To map and describe the spatial diversity in terms of drivers, outcomes and trends of the food systems across the country	**5Ind**	*Document a selection of drivers and outcomes, at subnational level, and map them across the country*
		5Doc	*Review key subnational policy documents and specific literature*

		5Tren	*Document key trends (historical and projections, when available) for key drivers and outcomes at subnational level and map them across the country (for those identified as being "at risk" in tasks 2Tren, 2Doc, 2Int)*
	To define tentative boundaries of areas within which the food system components and the challenges to be tackled to meet their sustainability goals are relatively homogeneous	5Ana	*Combine the spatial distribution of the different components considered in step 5 to draw consistent territorial units to analysis the food system. Other pre- identified criteria for delimitation and existing maps can be exploited as well*
	To draw a preliminary summary and systemic picture of each territorial food system	5Wri	*Describe the combination of specific challenges per defined area (generated from drivers, trends, outcomes, food balances, main products and actors/activities)*
STEP 6 [Consulting] Share and discuss territorial food systems, reach agreement and discuss bottlenecks and opportunities	To confirm the relevance of adopting a territorial perspective to food system analysis To agree on roughly defined territories within which the challenges to reaching sustainable food system goals are relatively homogeneous To start discussions concerning: (i) the priority areas where challenges are particularly pressing and/or that have a determining influence at national level/are critical in the achievement of core sustainable food system goals; and (ii) the priority dimensions which may be keys to generate transformative changes and have cascading effects on various dimensions of SFS goals	6Sh	*Organize a workshop:* *To present a summary of the food system assessment* *To present a proposal to break down the national food system into a set of subnational territorial food systems* *To discuss the challenges posed at territorial levels* *To facilitate discussion concerning the identification of geographic and/or thematic issues for transformative actions, as well as the actors who are critical for the design and implementation of such actions*
STEP 7 [Synthesis] Summarize main results	To provide a systemic and territorially differentiated summary of the drivers, outcomes and trends of the food system, including both quantitative indicators and qualitative appraisal, in a multidimensional perspective	7Wri	*Write a policy brief of the food system assessment + territorial food systems profiles*

Appendix 3. Comparison between rapid and extended assessments

Steps: rapid assessment	Steps: extended assessment
Step 0: Prepare	STEP 0 [Prepare]
Step A: Framing the issues	STEP 1 [Consultation]: Frame the issues
Step B: Document and data analysis	STEP 2 [National entry]: Document the main challenges and opportunities of food system at national scale
Step C: Qualitative appraisal and mapping	STEP 3 [Interviews]: Conduct qualitative appraisal of main challenges and opportunities of the food system
	STEP 4 [Consulting]: Share and discuss preliminary results at national scale
	STEP 5 [Spatial distribution]: Identify and characterize territorial food systems
Step D: Share, discuss and reach agreement	STEP 6 [Consulting]: Share and discuss territorial food systems and reach agreement and discuss bottlenecks and opportunities
Step E: Summarize	STEP 7 [Synthesize] Summarize main results