Improving nutrition by strengthening the diversity, sustainability, resilience and connectivity of food systems

D8.3 - Living Document

Healthy FoodAfrica

This project has received funding from the European Un-

Summary

The goal of HealthyFoodAfrica (HFA) is to increase the resilience of food systems and to link food production to nutrition performance, thereby increasing the range and quality of food products for a healthy diet. This Living Document aims at continuously consolidating the main findings through regular updates. The document will therefore evolve over the lifetime of the project.

The Living Document is meant to:

- constitute a formal expression of the project learning process, assimilating the lessons learned from the various Food System Labs (FSLs) and Work Packages (WPs);
- foster cross-scale action in the 6 African countries hosting the project's 10 FSLs;
- support research and educational approaches, capacity building, and local initiatives and food policy development across Africa;
- eventually feed into the synthesis of project results and lessons learnt.

All project partners are encouraged to contribute to the evolution of the Living Document. Engagement can be via feedback to the document, own contributions and discussion sessions during project meetings as well as on-demand.

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[1] R = Report, P = Prototype, D = Demonstrator, O = Other
[2] PU = Public, CO = Confidential, only for members of the consortium (including the Commission Services)

Table of Content

1. Introduction

The HealthyFoodAfrica (HFA) project

HealthyFoodAfrica (HFA) aims to increase the diversity, sustainability, resilience and connectivity of food systems in 10 cities and 6 countries in Eastern, Western and Southern Africa. To achieve this, it engages with farmers, food processors, retailers, civil society organisations (CSOs), policymakers and local experts, and helps them create and test innovative technologies, practices and governance arrangements that contribute to a more sustainable, resilient and healthy food system.

HFA applies an adaptive whole systems approach to transforming local food systems – from individual dietary norms to food supply and access, from new sustainable technologies and practices to wider policy frameworks and business models. The aim is to link food production to nutrition performance. Particular attention is paid to increasing the range and quality of food products for a healthy diet, and lasting improvements in supply chain governance, new food products and technologies.

The project is action-oriented, and builds on existing networks and initiatives, facilitating a structured process to experimentation and scaling-up of new approaches by local actors in the food system through a Food System Lab (FSL) approach. Innovation plays an important role in the project. The labs will serve as a deliberative space which allows researchers, practitioners and policymakers to develop lasting relations, common understanding and innovations that will go on beyond the timeframe of the project.

Aim of the Living Document

The document aims at continuously consolidating the main outcomes and findings from the HFA project. It constitutes a formal expression of the project learning process, assimilating the lessons learned from the various FSLs and thematic work packages (WPs) during the lifetime of the project.

The document will provide a mechanism for consolidation of results, and foster cross-scale action within the 6 countries hosting the food labs, and beyond. We expect that this Living Document will in this way support research and educational approaches, capacity building, and local initiatives and food policy development across Africa. The document will ultimately feed into the synthesis of project results and lessons learnt.

All project partners are encouraged to contribute to the evolution of the Living Document. Engagement can be via feedback to the document, own contributions, and dedicated discussion sessions during project meetings as well as on-demand.
All project partners are also encouraged to get in touch with the authors of the respective deliverables if they think that an important aspect has been overlooked, needs to be strengthened, or if connections across WPs can or need to be made or reinforced etc.
This document is in this sense also meant to trigger cross-WP coordination and learning.

How the Living Document is evolving

The elaboration of the document will follow the research stages over the life of the project. Practically, we will, once a key deliverable (Dx.y) has been finalised, present a brief synopsis of the main ideas, lessons learned, and knowledge created. It is kick-started with a synopsis of the project's strategic roadmap. This is followed by the main findings from the 5 thematic WPs, which encompass the central components in every food system. The Living Document is concluded with the main lessons learned from applying a transdisciplinary Food System Lab approach, and the joint work towards achieving a transformational impact.

As the analyses progress over the 4.5 years duration of the project, this Living Document will provide a more and more complete picture of the main ideas, lessons learned, and knowledge created. We expect that the document will help to enhance the knowledge which can be used by researchers, policymakers and entrepreneurs to better understand the transformations that occurred and apply it elsewhere.

Structure of this document

The structure of this document broadly follows the thematic WP structure of the project. For each deliverable (D) listed below the main ideas, lessons learned, and knowledge created is summarised on approx. 2 pages. In this first version of the Living Document only those deliverables are summarised that have already been completed. A summary of the 'Strategic roadmap for the project' (D1.1) is included as it helps to connect across WPs.

Practice and Policy Briefs are not separately included as they can be seen as summaries in themselves. Also, materials from supporting WPs, workshops, tools, training materials, technical fiches, etc. are not included as the focus of this document is on the project's thematic WPs and cross-disciplinary connections and learning.

The document is divided into 8 sections (each with the most relevant deliverables):

- Strategic roadmap for the project (D1.1)
- Nutrition and consumption (D2.1, D2.2, D2.3)
- Sustainable production (D3.1, D3.2)
- Postharvest technology and food safety (D4.1, D4.2, D4.3)
- Agri-food chain governance (D5.1, D5.2, D5.4)
- Innovative foods products and processes (D6.1, D6.3, D6.5)
- Achieving a transformational impact (D7.2, D7.3)
- Lessons learned from applying a transdisciplinary Food System Lab approach (D1.2, D1.3)

The deliverables referred to so far are included in the references section of each chapter; always as the first reference and with a link to Tiimeri (https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/_layouts/15/start.aspx#/). Other references are only included if referred to in this summary.

2. Strategic roadmap for the project

2.1 Aims

The strategic roadmap is to orient partners about the way forward. More specifically, it aims at:

- Co-creating a common understanding of the common goals of the joint work and of the way ahead (a joint vision), as well as of the transdisciplinary and stakeholder engagement processes that are vitally important in HFA.
- Improving our understanding of the different components of the HFA project and their linkages (FSLs, Thematic WPs and Supporting WPs).
- Explaining and amplifying the importance of connecting the work in the Food System Labs (FSL) with the thematic work (Thematic WPs)

The strategic roadmap document introduces the main components of the project and how they are connected. The sequencing of activities and stakeholder engagement are presented as critically important in the implementation of HFA. Interactions, iterations, feedback loops and coordination play a central role in the required processes. The roadmap clarifies the steps to be taken and how they build on each other.

2.2 Main points emphasised in the roadmap document

To maximise transformational impact, attention will need to be paid to encouraging actual innovation in food chain governance, technologies, and business models. Other important measures for fostering transformational impact are extracting and disseminating lessons learnt, building capacities, stakeholder engagement from the early stages of the project, and, above all, paying attention to policies that enable promising and scalable governance arrangements.

Each FSL has unique local knowledge and expertise, and it provides a space for experimentation, innovation, transformation, application of knowledge and co-learning, and thus the formation of new, collective insights. The basic idea of co-learning in HFA is that no matter what these trajectories and steps to be taken are, they will mean learning among all involved, and they will facilitate higher project level learning. Activities build on previous and ongoing activities, and experiences and thus promote cross-learning. They are driven by the practice partners in the FSLs with researchers being in a supporting and facilitating role.

The process in HFA tends to be incremental and iterative with important feedback loops. The project's success therefore depends very considerably on information sharing and continuous coordination. This allows to build and foster synergies in our joint work. WP1 is facilitating the

process; and WP7 making sure that things are planned towards achieving transformational impact.

All project participants in HFA are encouraged to develop and experiment with new ideas and approaches. Examples are:

- New contractual arrangements and more effective strategies in targeting local, national and international markets,
- Innovative governance arrangements, for example, mechanisms that lower the dependency on oligopolistic actors and provide direct links between producers and consumers, such as collective producer-consumer actions or ICT-based platforms.
- Development of new products, and new and innovative ways of processing local foods in collaboration with local food industries,
- New tools and technologies for better post-harvest handling and to guarantee food safety.
- Improved information on market price, improved logistics, better delivery mechanisms and improved packaging.
- New forms of capacity building and training among different stakeholder groups.

All engaged in FSL activities will simultaneously build their capacity to develop and manage sustainable food systems and to innovate in processes, products and marketing strategies.

2.3 References

Knickel, K., L. Rosengren, A. Turinawe & R. Isoto (2020) A Strategic Roadmap for HealthyFoodAfrica (HFA), D1.1., University of Helsinki / Makerere University. URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP1_Transdisciplinary%20pathways/HealthyFoodAfrica%20D1-1_Roadmap.pdf

3. Nutrition and consumption

When aiming to promote healthier and more sustainable food system transitions, developing a well-informed framework is crucial. To achieve this, D2.1 proposes an analytical framework that places food consumption and healthy nutrition in the wider context of the food system. The framework takes a practice-based approach to nutrition, covering 4 main interrelated components:

- dietary intake,
- food acquisition practices,
- food environment, and
- food chain.

Additionally, D2.1 proposes a selection of indicators connected to each of the framework's components and elaborates on the methodological approach used to operationalize them.

3.1 Analytical framework and key indicators for assessing food consumption and healthy nutrition

When it comes to understanding how to improve nutrition, investigating the different factors driving food consumption is crucial. The two most used frameworks conceptualizing these factors are the socio-ecological and the Agriculture, Nutrition, and Health Academy Food Environment Working Group (ANH-FEWG) (Turner *et al*., 2018) frameworks.

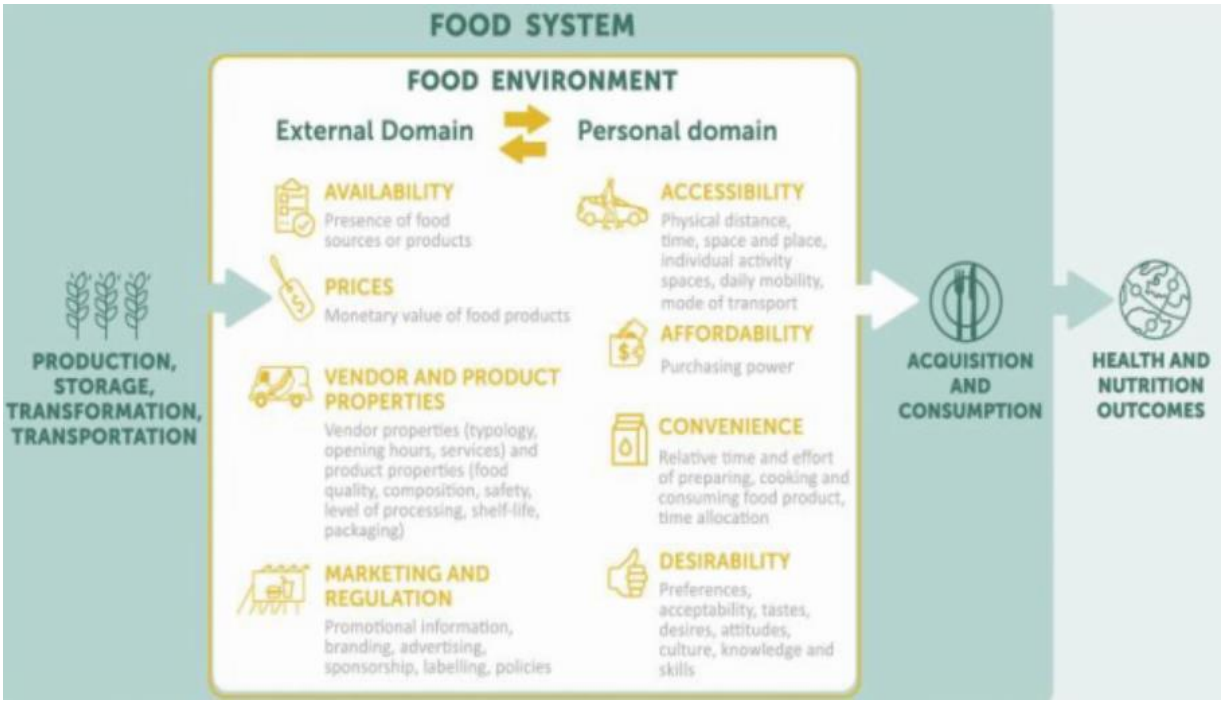
The socio-ecological framework explores the connection between people and their environment. Related to nutritional questions, the framework is based on the notion that food choices are not only driven by individual factors but also by multiple-level factors that all interact directly and or indirectly. The framework describes 4 levels of factors that are described in more detail in D2.1:

- Individual level (personal)
- Social environment (networks)
- Physical environment (settings)
- Macro-level environment (policy)

The Agriculture, Nutrition and Health Academy Food Environment Working Group (ANH-FEWG) framework uses a more holistic approach, placing the food environment in the broader context of the food system. The food environment is defined as: The interface that mediates one's food acquisition and consumption with the wider food system. The food environment draws from a socio-ecological perspective and consists of two domains: external and internal (**Figure 3.1**). Each domain has 4 measurable dimensions. The external domain represents the physical setting

that influences food acquisition and consumption. The dimensions considered within this domain are availability, prices, vendor and product properties, and promotional information. On the other hand, the internal food environment relates to a set of individual dimensions encompassing food accessibility, affordability, convenience, and desirability.

Figure 3.1



Food system, food environment framework and key indicators
(Source: Turner et al., 2018)

The analytical framework draws from the conceptual approaches described in the literature review. However, it looks at nutrition from a social practices' perspective. This perspective is particularly relevant since the social environment and the contextual factors affecting food choices have been highly neglected among African urban realities. In fact, a recent systematic review, mapping drivers of dietary habits in urban African areas, revealed a clear tendency to study the individual-level factors. Cognitive drivers such as perceptions of body image and food quality, food tastes, and knowledge are predominantly investigated. However, food choices are not merely steered by rational processes. How people interact in the food environment is deeply organized in the structure of everyday life, where unconscious and routinized behaviours occur. Therefore, to develop effective interventions and improve nutrition among different target

groups, a more in-depth understanding of the contextualized food consumption practices is required.

A practice-based approach to nutrition is proposed, where food choices are embedded in the organization of everyday life and go beyond purely rational and conscious processes. Food acquisitioning practices (e.g. shopping and growing) are in the centre (**Figure 3.2**).

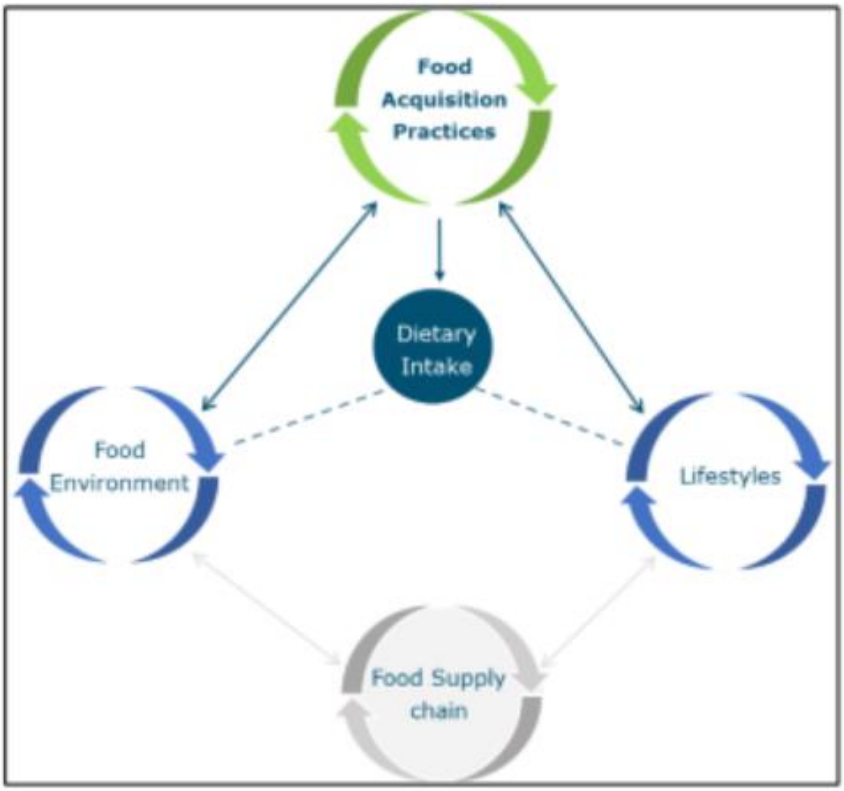


Figure 3.2
Food acquisition practices, food environment, lifestyles and food supply chains
(Source: Wertheim-Heck *et al*., 2019)

Based on the above, the 5 main components of the analytical framework are:

- Food acquisitioning practices
- Dietary intake
- Food environment
- Lifestyle
- Food supply chain

3.2 Indicator selection

For each of the above components a set of indicators are proposed. Several of the proposed indicators follow the city region food system (CRFS) toolkit (Carey et al., 2018). The CRFS toolkit is a planning tool designed to help cities assess their current food system status, following a whole-system approach.

First, the overarching objective, the outcome(s), and impact areas (key issues) that need to be addressed:

- Overarching objective: The overarching objective of WP2 is to improve nutrition and healthy dietary patterns through increasing awareness and rapid but sustainable transformation of consumption habits.
- Outcome: Outcome or 'desired direction of travel' are the types of changes that cities may want to see in the future. Our outcome was defined as: "Target populations have access to affordable, sufficient, nutritious, safe, adequate, and diversified food that contributes to healthy diets and meets dietary needs".
- Impact areas: The impact areas are more specific types of changes that could be measured. The most relevant impact areas were selected based on the project's information about the FSLs and in a first consultation with FSL partners.

For each impact area, the key issues to be measured and relevant indicators are identified (D2.1, Tables 1 & 2).

3.3 Methodological design and data collection methods

Methodologically, this WP takes a three steps approach, following a sequential quantitative-qualitative mixed-method design:

- Step 1: Measuring
- Step 2: Understanding
- Step 3: Participatory intervention design

Step 3 comprises problem articulation and solution development. Both will be implemented In workshop settings.

The methodological design and methods of data collection are described for each key indicator and step in D2.1.

3.4 References

Segreto, C., S. Wertheim-Heck, H. Renting, C. Termote, C. Chege, C. Musita (2021) Analytical Framework on food consumption and healthy nutrition, D2.1., Aeres University of Applied Science. URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP2/HFA-D2.1%20-%20Analytical%20framework%20-%20final.pdf

Carey, J., Dubbeling, M., & RUAF Foundation. (2018). City region food system toolkit tool/example. Published by Food and Agriculture Organization of the United Nations, RUAF Foundation and Wilfrid Laurier University, Centre for Sustainable Food Systems. http://www.fao.org/3/i9255en/I9255EN.pdf

Turner, C., Kadiyala, S., Anju, A., Coates, J., Drewnowski, A., Hawkes, C., ... & Walls, H. (2017) Food Environment WORKING GROUP: TECHNICAL BRIEF Concepts and methods for food environment research in low and middle income countries.

Wertheim-Heck, S, Raneri, J.E. & Oosterveer, P. (2019) Food Safety and nutrition for low income urbanites: exploring a social justice dilemma in consumption policy. Environment & Urbanization. 10.1177/0956247819858019.

4. Sustainable production

Food system sustainability is critical in the context of global socio-economic and environmental change. Meeting the demands of the growing global population for food without further compromising the biophysical basis of food production, or the socio-economic conditions that are a challenge per se.

D3.1 first explicitly discusses on the definition of both food system, the role of food production in the food system and of sustainability and its multiple dimensions. It then presents an indicator-based methodology and discusses how it can be operationalised. Potential indicators are identified.

4.1 Dimensions of sustainable food systems

Eakin *et al*. (2017) conceptualise food system sustainability based on 6 overlapping domains of knowledge that each represent a breadth of approaches on the sustainability of the world's food system (**Figure 4.1**).

Figure 4.1
Food system sustainability framework (Source: Eakin *et al*., 2017)

4.2 Indicators for assessing food production sustainability

4 dimensions of sustainability appear to be almost universally acknowledged in the literature related to food systems: environmental, economic, social, and food security and nutrition. The environmental, and food security and nutrition dimensions are differentiated further: 5 sub-dimensions are usually selected for the environment, namely air, water, soils and land, biodiversity, and energy. Food and nutrition sub-dimensions are food security, food safety, food wastes and losses, and nutrition.

Food production sustainability is most assessed through different types of indicator-based assessments, which rely on individual indicators, composite indicators or multi-criteria frameworks. Important is that the indicators to be used need to be contextually verified and that the community within which they are used ought to be involved in their final selection. Different forms of stakeholder and expert interaction in the selection of indicators are likely to result in more accurate and usable assessment results.

The indicators for assessing food production sustainability in HFA were selected based on a comprehensive literature review and further refined through sequences of discussions with partners. FSL-BDU, FSL-CSIR teams were asked to list indicators relevant to their food production systems. They are presented in in Tables 3 (ecological), 4 (economic) and 5 (socio-cultural) of D3.1.

4.3 Methodological approach

The following questions are to guide the finalisation of the methodological approach:

- How is sustainability of food production framed?
- What are the boundaries of the production system?
- What dimensions are assessed and how (indicators selected, weights of the indicators, visualisation method)

4.4 References

Juhola, S., A. Amsalu Aserse, M. Alemayehu, G. Tilahun, E. Adgo, S. K. Agyakwah, K. Lindström (2021) Analytical framework on local sustainable food production systems, D3.1, University of Helsinki. URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP3/HFA-D3.1-template-v2.pdf

Eakin, H., Connors, J. P., Wharton, C., Bertmann, F., Xiong, A., & Stoltzfus, J. (2017). Identifying attributes of food system sustainability: emerging themes and consensus. *Agriculture and Human Values*, 34(3), 757-773.

5. Postharvest technology and food safety

Food loss and waste are major contributing factors to the global and African food insecurity and their ongoing presence threatens the achievement of the UN Sustainable Development Goal (SDG) No. 2: Zero Hunger by the year 2030 and SDG No. 12: achieving sustainable consumption and production patterns (FAO, IFAD, UNICEF, WFP and WHO, 2020). FAO estimates that globally one third of all produced foods (1.3 billion tonnes of edible food) is lost and wasted in food supply chains (Ishangulyyev *et al.*, 2019).

D4.1 comprises a discussion of the food loss or waste and food safety challenges and gaps in postharvest handling practices and technologies, as well as a review of the current technologies used in the fruits and vegetables, and fish and poultry supply chains of the 5 FSLs that contribute to this analysis (Nairobi, Fort Portal, Accra, Chongwe and Lusaka). D4.1 is largely based on a literature review and limited primary data from FSLs. It identifies food loss challenges and gaps, and provides estimates of the extent, causes and consequences of food loss in the FSL countries for the selected supply chains (FSL specific data will still be gathered).

D4.1 also comprises a food loss assessment methodology for use in the FSLs. It defines food safety and highlights health, trade and economic impacts of food safety challenges. In addition, the paper identifies food safety challenges and gaps in the FSLs based on literature and information gathered from key informants.

Overall, D4.1 provides the foundation for the collection of baseline data on food safety and food loss in the FSLs. It already proposes some post-harvest improvements in terms of practices and technology interventions in the selected supply chains in the FSLs. In view of fostering a wide adoption and sustainability of innovations, the need for co-creation of innovations with the actors in the food supply chains of the FSLs is emphasised. D4.1 concludes with proposed food safety and food loss indicators, which can be used as a baseline to gauge the impact of the HFA project.

The examples provided in D4.1 illustrate that food safety and food loss challenges cut across sectors of the value chains and that addressing these challenges requires a multi-sectoral and integrated approach involving all the relevant stakeholders. This requires capacity building at all levels, infrastructure and adequate resources to ensure food safety thereby facilitating trade and improving public health.

5.1 Focus of the planned work

The schematic illustration in **Figure 5.1** describes the focus of the planned work.

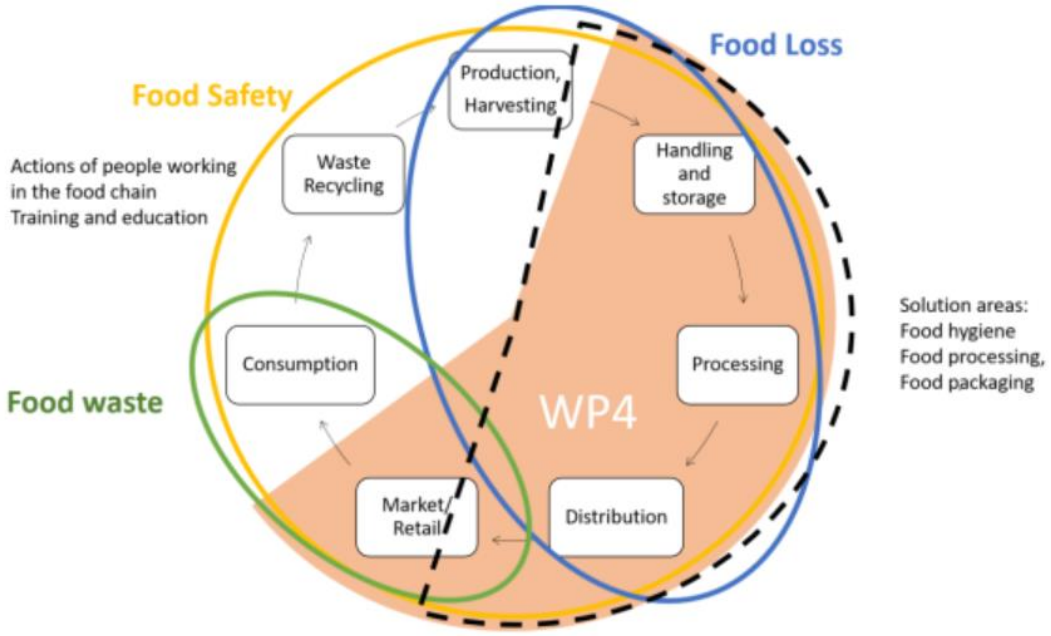


Figure 5.1

Focus of the work planned on postharvest technology and food safety (Source: D4.1)

WP4 focusses on the part of the food system that is marked orange. The circles (yellow for food safety, blue for food loss and green for food waste) represent the relationships of the central concepts in the food chain. The key development areas related to post-harvest handling and storage, food processing and distribution are covered in the area within the black dotted line. This is where many possible technical solutions may be found for handling, storage and transportation. Packaging is an important improvement option in food waste and safety. Principally, food packaging delivers physical, chemical and biological protection by shielding foods from mechanical damage, minimizes compositional changes triggered by environmental influences and provides a barrier to microorganisms, insects, rodents, and other animals. The choice of packaging is a complex process that depends on the product and its supply chain. Factors that need be considered include product quality, physical and chemical characteristics, transport and lengths, product contamination, stocking, material selection, packaging cost, etc.

Adequate control through food safety management systems integrating the prerequisite programs (PRPs) and principles of Hazard Analysis and Critical Control Point (HACCP) application steps is thus essential. Ensuring food safety is important especially to small and medium enterprises (SMEs), particularly those in the horticulture, aquaculture, and poultry sectors as they are

constrained by limited resources and lack of expertise concerning food safety standards and management systems.

5.2 Status-quo analysis

In Sub-Saharan Africa, fruits and vegetables have been found to have the highest losses of more than 50% (Delloite & Touche (2020).

D4.1 presents FAO's cause finding diagram which can be used to facilitate identification of the symptoms, alternative causes, real causes and underlying reasons to the problem of food loss (FAO and Save Food, 2014). Generally, the causes of food loss have been associated with inefficiencies in the food supply chain including inadequate technology, poor infrastructure, poor access to markets, and inadequate knowledge and management skills of the actors from harvesting to retail. Table 4 in D4.1 presents a summary overview of the main causes of food loss in food supply chains.

5 FSLs will contribute to the joint analysis and development work related to postharvest technology and food safety: Nairobi, Fort Portal, Accra, Chongwe and Lusaka. Their focus, challenges and planned contributions are summarised in Table 1 in D4.1.

D4.1 presents a set of tables on available food loss data, causes and possible interventions for selected countries in the HFA project:

- Table 5. Selected food supply chains in FSLs
- Table 6. Postharvest losses of vegetables
- Table 7. Postharvest losses of fruits
- Table 8. Postharvest losses of fish
- Table 9. Product and process interventions

In D4.1, also food safety issues of selected food commodities, as well as postharvest improvement options for a range of food products are discussed:

- fruits and vegetables
- fish
- poultry

Food safety indicators in food systems are identified.

D4.1 concludes with some possible improvements in post-harvest practices and technologies that the FSLs could adopt to enhance the food safety situation and reduce food losses or waste.

The listed practices and technologies have been identified through literature review and preliminary information from the FSLs. Related to further refinement and final selection, it is emphasised that a co-creation approach will be applied to increase the chances of adoption and sustained use of the adopted practices and technologies.

5.3 References

Shindano, J., M. Mukuma, Z. Safaei, V. Nyau, L. Mwelwa-Zgambo, T. Hachibamba, H. Koivula, D. Hikeezi (2021) Discussion paper on current food safety gaps, food losses and improvement options, D4.1., University of Zambia / University of Helsinki. URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP4/HealthyFoodAfrica-Deliverable%204.1_Final%2030.03.2021-GM.pdf

6. Agri-food chain governance

A main goal of HFA is to create more equitable and sustainable agri-food chains through innovative governance arrangements. Improved governance arrangements will strengthen the links between and empower local food chain actors to supply consumers with sustainable, healthy, nutritious and affordable food products.

6 FSLs are engaged in the work related to agri-food chain governance:

- FSL-Rw | Rwamwanja refugee settlement, Uganda, led by Finnish Church Aid (FCA)
- FSL-Ch | Chongwe, Zambia, led by Hivos
- FSL-Lu | Lusaka, Zambia, led by Hivos
- FSL-Ki | Kisumu, Kenya, led by Bioversity
- FSL-BD | Bahir Dar, Ethiopia, led by Bahir Dar University (BDU)
- FSL-Co | Cotonou, Benin, led by University of Abomey-Calavi (UAC).

D5.1 provides a conceptual framework, an analytical framework and indicators for assessing agri-food chain governance and identifies key questions for improving the efficiency and functioning of food chains. In the 6 FSLs, the current agri-food chains are mapped, key actors identified, and types of governance arrangements and power relations between different sized farms, small-medium-sized food enterprises (SMEs), retailers, and consumers analysed. The analysis is to inform agri-food chain actors as well as policy development concerning an efficient functioning of agri-food chains.

6.1 Conceptual framework

The conceptual framework presented in D5.1 comprises the concepts of value chain and value chain analysis, value chain theories (such as global value chain analysis, new institutional economics, social network theory, and supply chain management), governance arrangement in agri-food value chain, and the extended agri-food value chain governance arrangement with multi-dimensions.

Value chains are defined as encompassing the organization, coordination and linkages, power dynamics, and governance between actors. They are characterised by the dynamic relationships and interactions among the diverse actors involved in production to consumption activities for value creation and market linkages. Knowledge exchange, information sharing, capacity strengthening, joint learning, continuous problem solving and collective action are key features of functioning value chains.

'Governance' refers to the relationships and institutional mechanisms through which the coordination of activities and management of power dynamics between stakeholders in the value chain takes place. Institutions enable to shape how actors interrelate and act within and outside of organizations, and institutions are interlinked with knowledge, power and control. Critical elements include information exchange, price determination, regulations and standards, payment mechanisms, contracts, market power, lead firms, wholesale market systems. The analysis of current governance arrangements is used to identify opportunities and possible leverage points for interventions and changes.

6.2 Analytical framework and key indicators for assessing food value chain governance

The discussion of the analytical framework and key indicators for assessing food value chain governance in 6 FSLs includes a) an indicators selection methodology and selection criteria used to identify baseline indicators, as well as b) data collection methods for each key indicator to assess agri-food value chain governance in the 6 FSLs.

The key components of the analytical framework are presented in **Figure 6.1**. The 5 core dimensions of agricultural food chain governance are: enabling environment and institutions; governance structures; governance structure dynamics and determinants; governance structure and relationship strengths; governance practices for food chain activities and food chain actors in a specific context of the FSLs.

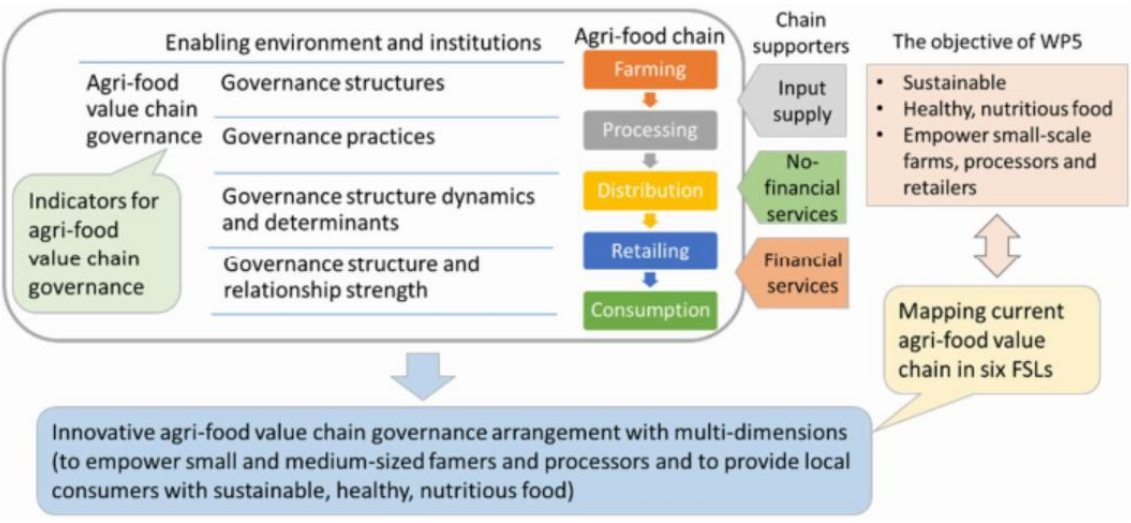


Figure 6.1
Key components of the analytical framework on food chain governance (Source: D5.1)

Overall, 15 indicators are identified for the 5 dimensions of agri-food value chain governance:

- Enabling environment and institutions: informal socio-cultural elements; formal institutional elements
- Governance structures: spot/cash markets; contracts governance; relation governance
- Governance structure dynamics and determinants: access to information and knowledge; participation in partnership networks; farmers and SMEs (suppliers) competences
- Governance structure and relationship strengths: linkages between chain actors; cooperatives and associations; multi-stakeholder platform
- Governance practices: price determination; value-added; finance service; non-market mechanisms

The identification and further development of relevant indicators for each dimension of agri-food value chain governance is seen as an ongoing process. Methods of monitoring and assessing the indicators will be developed once a set of indicators are identified and agreed upon by the task team, relevant project partners and the 6 FSLs leaders.

6.3 Status-quo analysis

When analysing the status-quo, the governance practices used are critically important. The following 4 key features are distinguished:

- Collaboration behaviour
- Cooperative society (e.g. producer associations and cooperatives, self-help group, facilitator-driven value chain models)
- Trust, mutual understanding, commitment, and long-term relationship
- Supply chain management practices including information exchange and sharing, information quality, price determination, payment mechanisms and business logic (business goals, development strategy and management instruments)

A preliminary analysis of current types of governance arrangements and of the power relations between farms, food SMEs, retailers and consumers of food chains for lead products in the 6 FSLs are presented.

The mapping of the 6 food chains focuses on objectives, challenges, and emerging opportunities in 6 FSLs. Types of governance arrangements and power relations between different size farms, food SMEs, retailers, and consumers in the FSLs are indicated, and key questions for improving the efficiency and functioning of food chain derived.

Table 8 in D5.1 shows the 6 FSLs food systems' objectives, challenges and emerging opportunities. This Is followed by a discussion of the different types of governance arrangements identified in the 6 FSLs, and the related power relations between different sized farms, food SMEs, retailers and consumers.

A first mapping of key value chains for the 6 FSLs is presented.

6.4 References

Chen, Q., A. Turinawe, R. Isoto, T. Mehreteab, J. Sumelius (2020) Analytical framework and indicators for assessing agri-food chain governance, D5.1, University of Helsinki / Makerere University / Norwegian Institute of Bioeconomy Research (NIBIO). URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP5/HealthyFoodAfrica-deliverable%20template%20Task%205.1.%20D.5.1%2011.27.2020.pdf

7. Innovative food products and processes

Sustainable novel food products and innovations have the potential to increase farmers and household incomes and provide healthier and safer food for consumer, as food innovations are affordable and nutritious for consumers.

A co-analysis of current trends, identification of opportunities in food products, processes and agro-business models was performed. A sustainable food system framework was used to analyse trends, diets, and the agri-food supply chains in food systems in Ghana and Kenya. This approach allowed to have an overview of the societal challenges in which innovations can contribute to food security and nutrition, and to set criteria for the selection of adaptation and/or promotion of innovations that are more effective and sustainability-driven.

The focus of this analysis is on Ghana and Kenya, where FSLs Kisumu, Tamale and Accra are located. Innovations were identified with local actors through workshops held by CSIR as FSL-Accra, and shared and discussed with WP6 partners, FSL-Kisumu and FSL-Tamale, and they respond to the criteria selected using the sustainable food system framework.

7.1 Background

As the demand for processed foods is increasing given the rising levels of urbanization, as well as population and economic development growth, the innovations proposed respond to a set of solutions and existing opportunities. In Ghana and Kenya, demand for processed foods is increasing as well as the length of supply chains. This phenomenon leads to many challenges where local producers have to adapt and in which novel food products and sustainable and inclusive innovation come as an opportunity, not only to increase income of actors in the supply chains but also to exercise the right to food under a food security and nutrition scheme.

7.2 Analytical framework

The analysis and discussion are structured by the Sustainable Food System Framework elaborated by the High-Level Panel of Experts on Food Security and Nutrition (HLPE, 2020) (**Figure 7.1**).

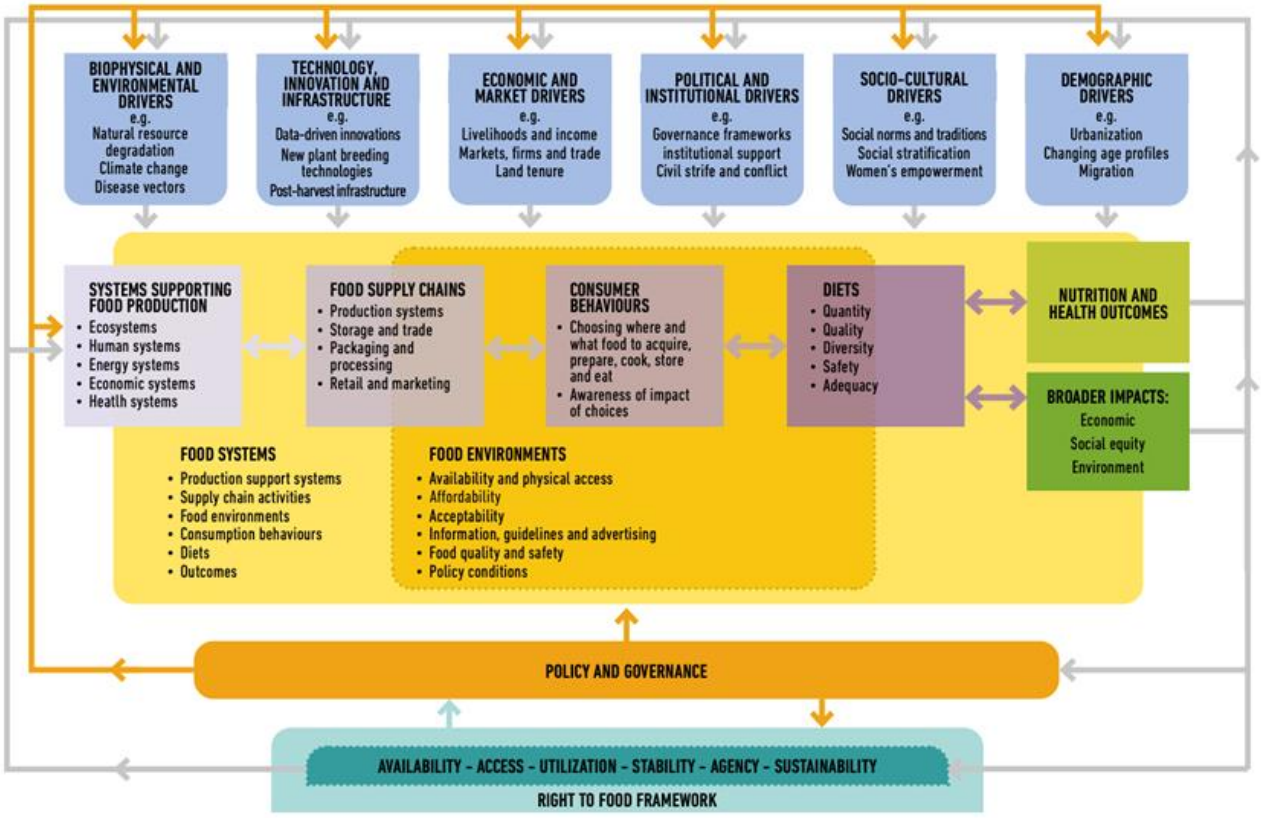


Figure 7.1

Sustainable Food System Framework elaborated by the High-Level Panel of Experts on Food Security and Nutrition (Source: HLPE, 2020)

7.3 Status-quo analysis

As a result of the status-quo analysis, it is concluded that social inclusion in agriculture is indispensable in the adoption of innovations through empowerment of woman in the supply chain and youth participation. As the rate of food loses in Ghana and Kenya are increasing because of deficient agricultural infrastructure, improvements should be made to reduce food losses more specifically in vegetables and cereals supply chains. In the face of a constant increase of prices of staple food in Kenya and Ghana, there is a big potential for adding value to the vegetable sector through innovation.

New marketing channels are growing in cities and modernization of processed and package foods are becoming more popular and represent an opportunity. On the nutritional aspect, it is important to pay attention to products that tackle the triple burden of malnutrition – underweight, overweight, and vitamin and mineral deficiencies – which persist in Ghana and Kenya.

Traditional leafy vegetables, indigenous plant-based protein sources, cereals, and fruits, as well as fish are identified as potential production systems that can contribute significantly to local economy, food security and nutrition in Kenyan and Ghanaian food systems. Food supply chains of traditional leafy vegetables and fish have deficiencies when it comes to storage and transportation, given their perishable nature and unhygienic manipulation, as often these are bought in informal markets where the shelf-life expectancy of these products is low. Therefore, innovative packing and processing could come as a handy solution to reduce the trending increase of food waste and promote healthier and safe food. Food production environments are relevant when thinking of market and there is potential for the innovations proposed as those products are widely consumed.

Fish and leafy vegetables also contribute to a healthy nutrition in the form of vitamins, calcium, phosphorous, iron among other minerals, and are also low in carbohydrates. The implementation of innovations will be accompanied by application of a business model canvas as a methodological approach to design and reach more sustainable and innovative business models, for profit, environment, socio-cultural acceptability and modernization, as well as for equitable equilibrium in governance of value chains. Women participation in Ghana has been considered when selecting novel fish products as they have an important role in the food supply chain of fish in Ghana, where fish processing and sales are mostly handled by women (business owner and helpers).

7.4 Potential innovation areas

Sustainable and innovative business models will be developed in FSL Accra. They include processed fish in different presentations for snacks, and soups, fish with different flavours, and broad bean mixed with fish powder and other ingredients to make soup and stew thickeners, moringa and baobab powder for smoothies, ready-to-eat fruity cereal mix, and soybean and leafy vegetables noodle.

Hydroponics is also considered as potential sustainable innovation in FSL-Kisumu. Böna Factory is creating food innovations combining the research and private sector with focus on plant-based protein products utilizing crops with low local value addition.

7.5 References

Alpizar Rojas, D., P. Prosperi, G. Brunori, A. Atter, S. Koranteng Agyakwah, S. Ahlberg (2021) Report on opportunities in food products and processes: an analysis of innovative alternatives in Ghana and Kenya using a Food System Framework, D6.1, CSIR / University of Pisa / House of Böna Ltd. URL: https://tila.tiimeri.fi/sites/luke-akronyymi_hfa/Deliverables/WP6/HFA_WP6_D6.1_30112020.pdf

HLPE (2020) Food Security and Nutrition: Building a Global Narrative towards 2030. High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Research Guides. https://research.un.org/en/foodsecurity/key-un-bodies

8. Lessons learned from applying a transdisciplinary Food System Lab approach

(to be completed later)

9. Achieving a transformational impact

(to be completed later)