A4NH Food Environment Consultative Workshop Report

Gina Kennedy
Giulia Rota Nodari

Acknowledgements

The CGIAR Research Program on Agriculture for Nutrition and Health (A4NH) Food Environment Consultative Workshop took place November 5 to 7, 2019, in Addis Ababa, Ethiopia, supported by the International Livestock Research Institute (ILRI).

This report was produced by Bioversity International and Wageningen University & Research. The production of this report was led by Gina Kennedy and Giulia Rota Nodari from Bioversity International, with contributions from Inge Brouwer, Anna Herforth, Shauna Downs, Mestawet Gebru and Francis Oduor.

Cover photo: Micheal Tedla Diressie.

Table of contents

Abbreviations and Acronyms

AAU	Addis Ababa University
A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
AMR	Antimicrobial resistance
CRP	CGIAR Research Program
CIFOR	Center for International Forestry Research
EPHI	Ethiopian Public Health Institute
FAO	Food and Agriculture Organisation of the United Nations
FBDG	Food-baed dietary guidelines
FE	Food environment
FSHD	Food Systems for Healthier Diets
HIC	High-income country
HLPE	High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security
ICRAF	World Agroforestry Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IRRI	International Rice Research Institute
LMIC	Low- and middle-income country
SDI	Socio-demographic index
WFP	World Food Programme

Tables and Figures

Tables

Figures

1. Introduction

In its role as an integrating CGIAR research program (CRP), Agriculture for Nutrition and Health (A4NH) has proposed to link its work on food systems to that of other CRPs (and Centers) and help link CGIAR researchers to the nutrition and public health communities with whom it works. Although there are varying degrees of A4NH and other CRP research around food systems, one research flagship – Food Systems for Healthier Diets (FSHD), led by Wageningen University & Research (WUR) and part of A4NH – leads research on this topic.

In 2019, A4NH and FSHD hosted two partner consultations in Ethiopia and Bangladesh to identify present activities related to food systems, discuss priority areas for collaboration, develop common food system narratives, and develop follow-up activities globally and for specific countries. During these meetings, it was recognized that food environments play a central role in connecting food supply systems with consumers, determining the availability and accessibility of healthy diets. However, it was also identified that although there is considerable anecdotal information, there are few studies and a paucity of evidence on how agri-food systems link to and interact with food environments in order to provide healthy diets for consumers. Developing food environment indicators was identified as one of the priority activities.

As a follow-up to the food systems consultations held in Ethiopia and Bangladesh, FSHD hosted a workshop with CGIAR partners in Ethiopia November 5-7, 2019. The workshop aimed to explore the concept of food environment and related research. Food environment research is considered of key importance to deepen the analysis of current national or regional food systems challenges, and to identify opportunities for (more) effective interventions by public institutions and market actors. The workshop was jointly organized by FSHD partners WUR and Bioversity International, in collaboration with the Food and Business Knowledge Platform and AgriProFocus Ethiopia.

Objectives of the workshop

The objectives of the workshop were to further a common understanding of food environment (FE) research, in particular methods, metrics and tools used to measure FE in low- and middle-income countries (LMIC) (Day 1); to review the FE methods, metrics and tools used by CGIAR centers and highlight areas of synergy and to contribute to toolkit development (Days 1 and 2) and to sensitize stakeholders on the importance of understanding the FE and validate the developed FE thinking (Day 3).

The first two days of the workshop brought together approximately 23 participants, representing CGIAR centers Bioversity International, CIFOR, ICRAF, ICRISAT, IFPRI, IRRI, and Worldfish; Harvest Plus; WUR, Rutgers University School of Public Health, the Ethiopian Public Health Institute (EPHI); and the World Food Program (WFP).

On the final day of the workshop, 12 participants, representing Ethiopian stakeholders including the Food and Agriculture Organization of the United Nations (FAO)-Ethiopia, CASCAPE, Addis Ababa University, the World Bank, BENEFIT, Addis Continental University, EPHI, and the Netherlands Embassy in Ethiopia, joined the meeting.[1]

[1] CASCAPE is the Capacity building for Scaling up of Evidence-based best practices in agricultural production in Ethiopia project. BENEFIT is the Bilateral Ethiopia Netherlands Effort for Food, Income, and Trade Partnership.

Structure of the workshop

The workshop aimed at providing participants with an overview of food environment research, to stimulate discussions on how this area of research has been and can be integrated further into (nutrition) programs across CGIAR (Days 1 and 2) and how this can be translated into the Ethiopian context (Day 3).

Before the workshop started, participants were provided with an overview of food environment research and measurement tools and a list of recommended readings.

The workshop combined presentations from subject experts, group discussion, and a field visit to market areas in Addis Ababa to test the application of selected food environment methods and tools. The workshop agenda can be found in Annex 1.

2. Towards a new food system approach

Presentation: '*Overview of meeting objectives and program,'* by Inge Brouwer

The workshop started with an introductory note about the challenges and opportunities in food system research for improving diets for better health and nutrition. Inge Brouwer, Associate Professor of Food and Nutrition at WUR and Flagship leader for FSHD, first provided an overview of how the current food system is failing to address health, environmental and social outcomes. From a nutrition perspective, undernourishment is on the rise around the world (FAO, SOFI 2019) and the patterns of malnutrition are changing as economies are transitioning. In this context, diet is considered both "a victim and an instigator." However, researchers continue to work in silos in an attempt to address one problem at a time; for example, agricultural researchers are focused on improving the production and reducing food loss; economists on distribution and inclusive development; agroecologists on food systems exceeding the planetary boundaries.

Against this background, there is an urgent need for a reversed thinking that brings together all the sectors in what is referred to as a "systems approach." Balanced, diverse and sufficient diets are the results of coordinated efforts by all sectors with multiple benefits for health, environmental sustainability and equitable economic development and outcomes.

To do this, a food systems approach should focus on national food systems and on diets rather than single food items. More attention should be given to the relationships between food system components and their actors, on technological and behavioral change, on the trade-offs and synergies and, in general, on conceptualizing the food system as dynamic.

In this context, food environment research represents an opportunity to rethink the food system from a diet perspective. The role of food environment as defined by Turner et al. (2017) is *"the interface that mediates one's food acquisition and consumption within the wider food system."* The food environment can be visually represented as positioned between the food supply chains and consumer behavior dimensions within the broader food system (Figure 1).

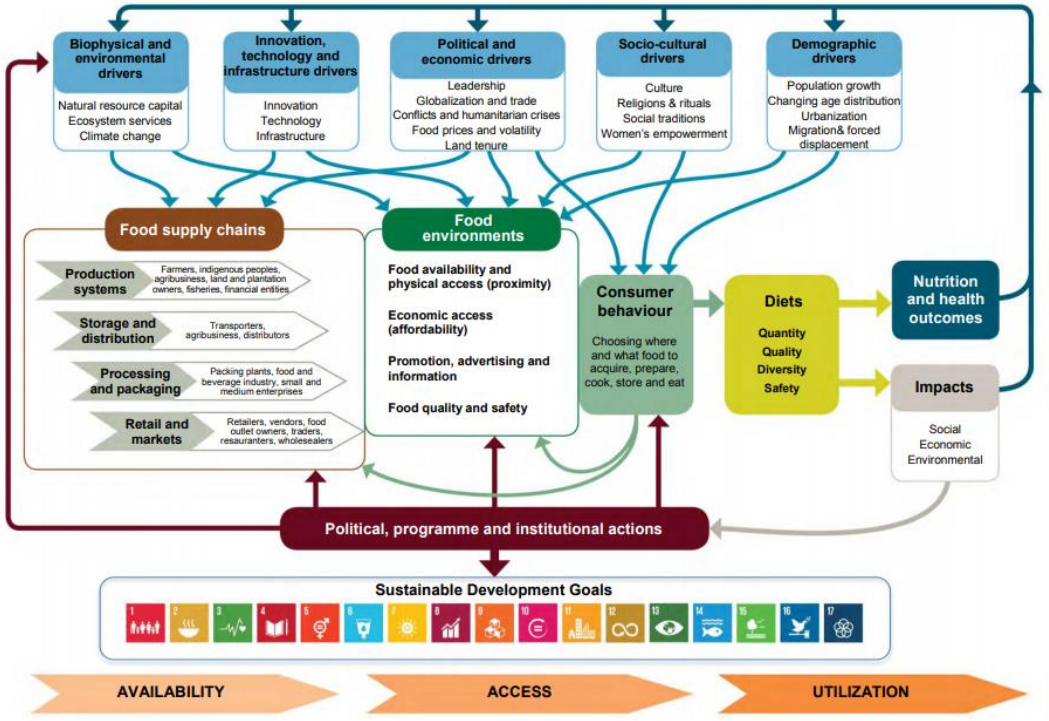

Figure 1: Food system framework. Source: HLPE (2017).

2.1 Improving access to healthy diets

Presentation: '*What do we mean by Food Environment?'* by Anna Herforth

Food access constitutes the link between agriculture and diet quality. Indeed, most agricultural and nutrition programs and interventions focus on food access to ensure diversified, balanced and healthy diets. Similarly, this concept is expressed in the definition of food security, where food access, in both physical and economic terms, is considered as a necessary condition for achieving nutrition outcomes[2].

However, there are different perspectives on what food access represents. For example, economists focus on income as a key factor for achieving food access, whereas ecologists focus on the availability of food within the landscape. Nevertheless, evidence shows income becomes irrelevant when nutritious foods are not sufficiently available. Indeed, data show it is not feasible for all to access a healthy diet given the current food supply[3]. Moreover, increased income does not necessarily translate into healthier eating patterns. Increased purchasing power is often associated with greater dietary diversification, but also to increased intake of ultra-processed foods, red meat, fats, oils and sugars. These patterns of dietary change are common in developing economies and it is referred as to the 'nutrition transition.'[4]

Moreover, these dietary transitions are not consistent across countries even at the same/similar income level (e.g. the US vs Italy). Thus it is important to understand what factors are determining such differences. Beyond individual factors such as income, it is the surrounding food environment that determines what foods are accessible to people. Food environments are constantly changing and even in rural areas of low-income countries, typically the majority of food is increasingly acquired through markets, particularly to close seasonal gaps in own production[5]. Cultivated, wild, and market food environments make up the types of food people can access, and the food market environment is an important part of access to sufficient safe, nutritious foods even for rural populations. It is also a place where people are exposed to ultra-processed foods, marketing and advertising.

In order to plan interventions that can lead to healthier diets, it is fundamental to understand the influcence of food environment factors. From a socio-ecological perspective, food environments, identified here as 'environmental settings', are determined by several other factors, such as other sectors of influence and social and cultural factors (Figure 2). All of these factors contribute to determining individual food choices.

[2] World Food Summit (1996). Rome Declaration on World Food Security.
[3] Herforth A. 2015. Access to Adequate Nutritious Food: New indicators to track progress and inform action. In: Sahn, D (ed.): The Fight against Hunger and Malnutrition. Oxford University Press and Keats and Wiggins (2014). Future diets. Implications for agriculture and food prices. Overseas Development Institute: London, UK.
[4] Popkin, B. M., Adair, L. S., & Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. Nutrition reviews, 70(1), 3–21. doi:10.1111/j.1753-4887.2011.00456.x
[5] Sibhatu K.T., Qaim M. (2017). Rural food security, subsistence agriculture, and seasonality. PLOS ONE 12(10): e0186406.

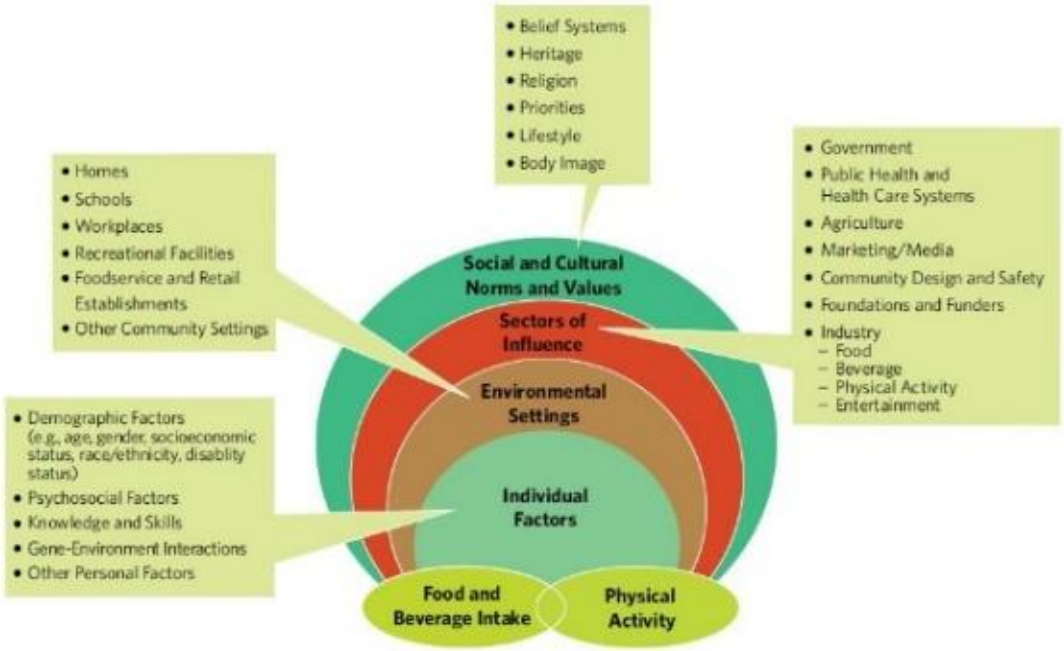

Figure 2: Social Ecological Model for Food and Beverage Intake. Source: Dietary Guidelines for Americans, 2010.

Other conceptualizations of the food environment, such as Swinburn et al. (2014) and Turner et al. (2017), bring the drivers (e.g. socio-cultural, policy etc.) and individual factors (e.g. desirability) into the definition of food environment. We refer to the definition of FAO (2016), the HPLE (2017) framework, and Herforth and Ahmed (2015), which focus on the environmental setting.

The HLPE (2017) food systems framework makes a distinction between the food environment and the drivers influencing it. In the HLPE framework *'key elements'* of the food environment are*: f*ood availability and physical access, food prices and affordability, promotion, advertising and information, and food quality and safety. 'Convenience and time savings' was not considered in the original HLPE framework, but was added during our workshop as an additional element (Figure 3), following Herforth and Ahmed (2015), who defined the food environment as including the key elements of availability, affordability, convenience, and desirability (the latter term referring to quality, safety, promotion, and advertising).

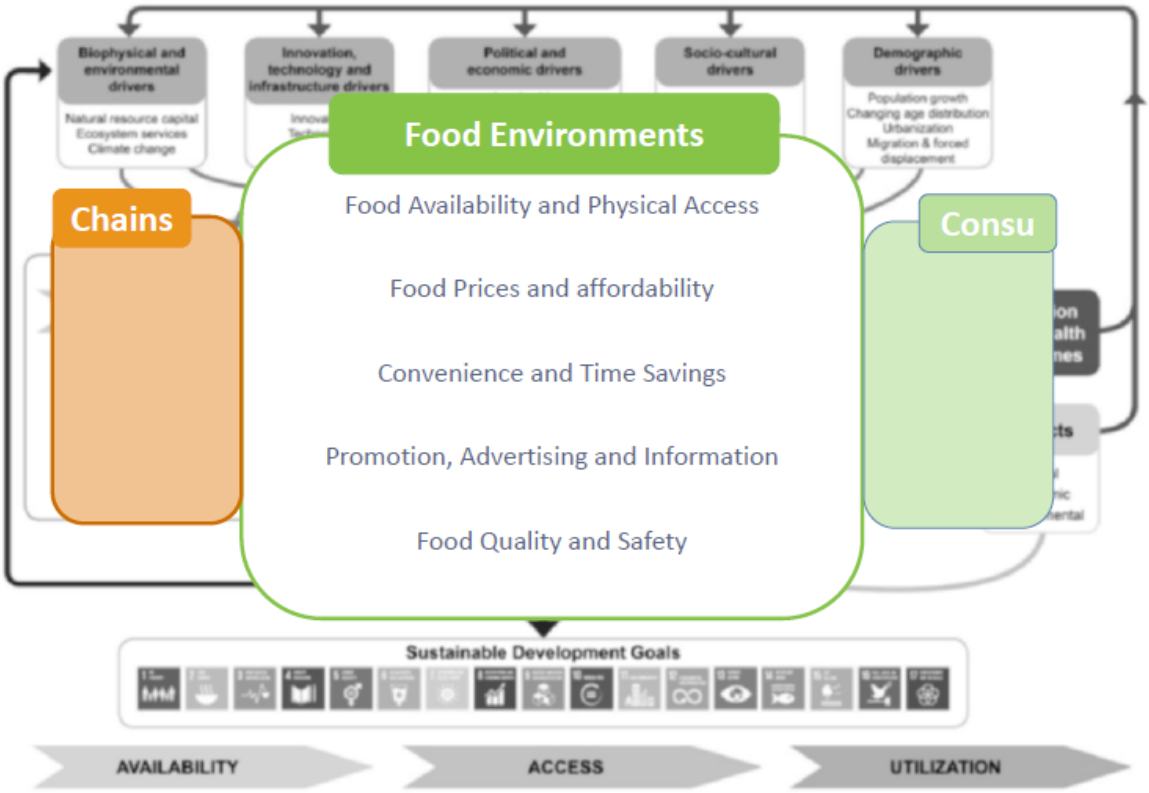

Figure 3: The 'key elements' of the food environment (adapted from the HLPE 2017 framework).

Based on this framework, examples are provided to show how these elements relate with consumers' food choices and diets. For example, evidence shows that nutritious and healthy foods are not always sufficiently available to meet dietary requirements. In sub-Saharan Africa, existing data show that per-capita availability of fruits and vegetables is far below recommended intake[6].

From an affordability perspective, in many countries, a nutritionally-adequate diet costs three times more than a staple-based one[7], and the cost of diets that satisfy dietary recommendations was found to be highly unaffordable across several countries[8]. Moreover, in some countries, nutritious foods such as fruits and vegetables are several times more costly than staples[9].

Convenience foods such as ready-to-eat foods are becoming increasingly common across both high-income countries (HIC) and LMIC. From a nutrition perspective, convenience foods are neither more or less healthy than non-convenience foods, and processing of foods does add to convenience. Convenience, including the diversity, price, quality and safety of more convenient foods, deserves greater attention within food environment research.

[6] Herforth, A. (2015). Access to Adequate Nutritious Food: New Indicators to Track Progress and Inform Action. In: Sahn, D. (Ed.) The Fight Against Hunger and Malnutrition. Oxford University Press.
[7] Alemu, R., Bai, Y., Block, S., Headey, D., & Masters, W. A. (2019). Cost and Affordability of Nutritious Diets at Retail Prices: Evidence from 744 Foods in 159 Countries. Available at SSRN 3485330.
[8] Dizon F, Herforth A, Wang Z. 2019. The cost of a nutritious diet in Afghanistan, Bangladesh, Pakistan, and Sri Lanka. Global Food Security 21: 38-51.
[9] Headey, D. D., & Alderman, H. H. (2019). The relative caloric prices of healthy and unhealthy foods differ systematically across income levels and continents. The Journal of nutrition, 149(11), 2020-2033.

Promotion and advertising are directed toward increasing consumer desirability and drive the purchasing of foods. Depending on the product being promoted, promotion and advertising can lead to both the acquisition of unhealthy (e.g. sugar sweetened beverages) and healthy foods (e.g. fruit or nuts).

Food quality and safety determine what foods are purchased by consumers and may affect food choice, being related to the freshness and appeal, as well as the perceived and actual safety of foods being aquired (purchased, home produced, sourced from the wild).

In the FSHD context, FE is studied to help identify interventions to improve access to healthy diets, including improving the availability of nutritious foods rather than increasing the availability of staples and staple-based food products, improving their affordability, making them more appealing (e.g. promotion of nutritious and disregarded traditional foods) and making them safer.

To study the FE, a set of common metrics to measure and assess the impact of food environment, interventions is needed.

2.2 A food environment typology

Presentation: '*Food Environment typology and Food Environment transition over time,'* by Shauna Downs

Food environments are very different across countries and have different characteristics depending on context and stage of development. However, food environment research has been conducted mainly in HIC, focusing on modern food retail. Indeed, this area was found to be particularly under-researched in LMIC (Turner et al., 2019). In these settings, food acquisition is mediated through different types of food environments including wild, cultivated, and built. Therefore, there is a need to capture these aspects through the development of a food environment typology.

Based on research experience in LMIC and on the existing literature on this matter, Downs, Ahmed, Fanzo & Herforth (forthcoming) recently developed a food environment typology. Food environments are broken down into two categories: 'natural' and 'built' (Figure 4).

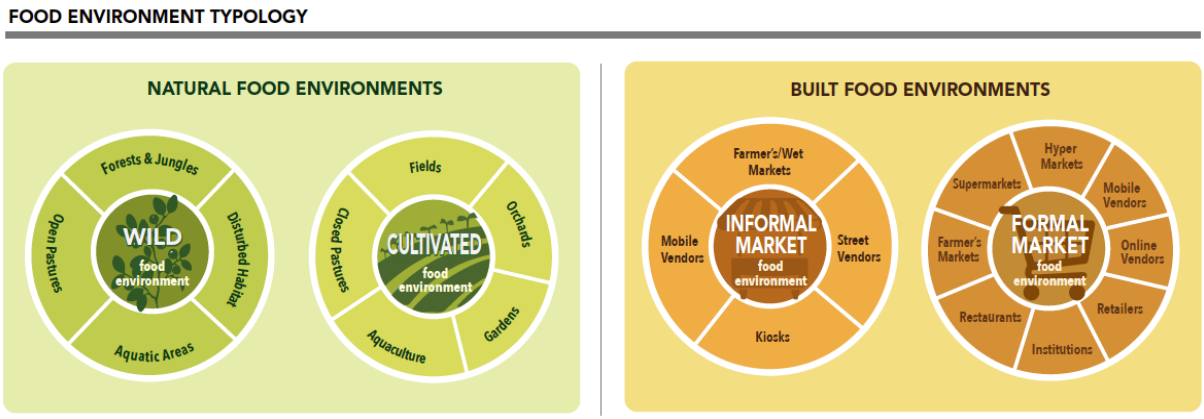

Figure 4: A food environment typology. Source: Downs, Ahmed & Herforth, forthcoming.

Natural food environments are divided into 'wild' and 'cultivated', referring respectively to the wild (e.g. rivers, forest, open pastures, etc.) and cultivated (e.g. fields, orchards, aquaculture, etc.) settings through which food is acquired. **Built food environments** are divided into 'informal' and 'formal' markets, referring respectively to the informal (e.g. farmers' markets, kiosks, mobile vendors, etc.) and formal (e.g. supermarkets, restaurants, online vendors, etc.) retail settings.

These food environment types have been defined using several parameters, identified using the ‘key elements’ of the food environment, availability, affordability, convenience, and promotion and quality, adapted from the HPLE (2017) framework. For example, food availability in natural food environments depends on the diversity of crops within the region as well as on the seasonality. Built food environments are often characterized by a greater diversity of food options, especially in formal markets, but also availability of processed foods (including ultra-processed).

Rather than monetary exchanges in natural food environments, the affordability dimension consists of the trading of goods. In the informal markets, staple foods are generally less expensive than other food items such as fruits, meats and pulses. Processed foods may be sold in small packages to make them more affordable, particularly in local village kiosks.

Food promotion is more prominent in formal than informal markets. Most packaged food in formal markets is labelled and there are often higher standards of quality and safety. Food quality and freshness may vary in cultivated and informal markets depending on the time of harvesting and on the storage conditions, whereas in wild food environments, food is generally consumed fresh.

These food environment types are not mutually exclusive, but may coexist within hte same country and change over time. As economies transition from low to high socio-demographic index (SDI), there is a general shift toward built food environments. From a nutrition perspective, these patterns of change may lead to increased access to nutrient-rich foods, but also to ultra-processed foods. These dietary transitions involve shifts in dietary risk factors. From a policy perspective, it is important to consider that food environments are constantly changing, and interventions need to be planned accordingly.

3. Metrics and tools

3.1 Presented metrics and tools

Presentation: '*Overview of Metrics and Tools in Food Environment Research,'* by Anna Herforth and Shauna Downs

The presentation started with outlining the benefits of measuring food environments for agriculture and nutrition research. These are: "a) predict and understand the likely effect of additional income on diets, b) monitor and evaluate the effect of the program on the food environment, and c) design better nutrition-sensitive programs to fill supply and demand gaps based on understanding of the existing food environment." Measures are divided into 'objective' and 'perceived.' Examples of objective measures are the availability and prices of diverse foods, the NEMS-S survey (Nutrition Environment Measures Survey for Stores), the ProColor tool, the Cost of Recommended Diet tool (CoRD) and the use of GIS for mapping food outlets. Examples of perceived measures include perceived access and availability of healthy food.

During the workshop, a brief selection of methods and tools were presented. Ursulla Truebwasser presented the Photovoice method used to study how adolescents in Addis Ababa perceived their food environment, by asking them to make pictures of their food environment and discuss in the class to identify key factors in the food environment determining their food choices. Gina Kennedy presented the Retail Diversity for Dietary Diversity study carried out in Vietnam looking at how, through retail interventions, availability of vegetables to consumers can be improved. Methods used included a food retail outlet census and classification, a food shopping practices survey, a food prices survey, a 24-hour dietary recall, and in-depth multi-generational interviews. Inge Brouwer presented the Retail Diversity Index, being developed and emperically tested to assess the diversity of foods available through food retail sources. Zebibba Ayenew presented the Fill the Nutrient Gap methodology used by WFP to provide information on the minimum costs of a nutritious diet, affordability of the costs among households, and environmental footprint of current and recommended diets to support prioritization of interventions and policy options to improve availability, access and affordability of healthy diets and to promote shifts toward diets that mitigate climate and water crises while meeting nutrient demands.

The methods 'Produce Color (ProColor)', 'Produce Desirability (ProDes)', 'Cost of Recommended Diet (CoRD)' and 'Photo Documentation' were presented and field tested in different outlets of Addis Ababa. The methods are described in more detail below. The aim of the field testing was to explore the applicability of the tools to capture the food environment in these settings and to collect feedback from participants on their usability. The selection of these tools is not based on a systematic review but rather on feasibility and applicability.

Produce Color

The **Produce color** (**ProColor) diversity tool,** developed by Selena Ahmed et al., can be used to measure the diversity of fruits and vegetables in food outlets (stores and markets) by recording the color of their flesh, as a proxy for the presence of specific phytochemicals and nutrients (Box 1) (Ahmed et

Box 1: Example of phytochemicals associated with each color

- **Green** – beta carotene, lutein, and chlorophyll
- **Red** – lycopene (and other carotenoids), anthocyanins (and other flavonoids)
- **Orange** – beta carotene (and other carotenoids)
- **Yellow** – lutein, zeaxanthin, and flavonoids
- **Purple and blue** – anthocyanins (and other flavonoids)
- **White** – anthoxanthins

Source: Ahmed et al., forthcoming.

al., forthcoming). For example, the color 'green' is associated with phytochemicals such as beta carotene, lutein and chlorophyll.

Participants tested this tool by assessing the color diversity of fruits and vegetables they found during the field trip to market areas in Addis Ababa. To facilitate the assessment, participants were encouraged to take pictures of the fresh produce encountered. Once back at the workshop, these pictures were analyzed and assigned to different color categories, separated as fruits or vegetables. Figure 5 shows an example of a survey sheet used for collecting vegetable diversity; the same sheet was used for fruits with the exception of the 'Dark Leafy Green' color category. Using the diversity found, different measures of the available fruit and vegetable diversity can be calculated as follows:

- **Total Diversity**: the total number of items regardless of color category
- **Total Color Category Diversity**: the number of color categories represented by at least one item
- **Total Diversity Score:** the sum of the **Total Diversity** and the **Total Color Category Diversity**
- **Relative Color Density:** the number of items per color category divided by total number of items

PART 2: Fresh Vegetable Color Diversity

Dark Leafy Green	Other Green	Red	Orange and Yellow	Purple and Blue	White

Figure 5: ProColor survey sheet for collecting the vegetable color diversity. Source: Ahmed et al., forthcoming.

Produce Desirability (field tested during the workshop)

The **Produce Desirability (ProDes)** tool aims to assess fruit and vegetable quality, a key part of desirability (Ahmed et al., 2018) Enumerators give a score to fresh fruits and vegetables ranging from 0 to 6, where '0' is the lowest (not desirable) and '6' is the highest score (most desirable), based on five observational measures: Overall desirability, Visual appeal, Touch and Firmness, Aroma, and Size. Participants tested this tool by using fresh fruits and vegetables gathered from the market and supermarket (Figure 6). Ratings should be as objective as possible and should not be based on personal preferences. Calculations followed to assess the overall desirability of the different fruits and vegetables.

Cost of Recommended Diet (field tested during the workshop)

The **Cost of Recommended Diet (CoRD)** is "an indicator of economic access to food, specifically the retail cost of a diet that adheres to dietary recommendations. It is constructed combining information on the recommended intake of each food group, that is available in the Food Based Dietary Guidelines (FBDGs), with food prices (from primary or secondary data)" (Cost of Nutritious Diets Consortium, 2018).

To calculate the cost of the recommended diet, participants were encuraged to collect prices of food items from different food groups (grains and tubers, fruits, vegetables, pulses, dairy, etc.) in the different food outlets (market, supermarket, roadstands etc.). Once back at the workshop, prices were entered and converted from cost per unit (Kg) into cost per edible serving, and the two least costly food items were selected for each food group. To calculate the cost of consuming each food group, the cost per

serving was multiplied by the number of servings recommended[10] per food group. All costs were added together to calculate the daily cost of meeting the recommended diet.

Figure 6: On the right, testing of the ProDes questionnaire on fresh fruits and vegetables gathered in different food outlets of Addis. On the left, ProDes questionnaire to assess the desirability of fruits and vegetables.

Photo documentation (field tested durign the workshop)

The **Photo documentation** method aims to capture the food environment in a more visual way, to enrich the data collected through the various other tools. This tool involves documenting different aspects of the food environment (e.g. availability, convenience, food quality and safety, etc.) by capturing photos that represent or portray the different food environment characteristics. An example of the application of this tool can be found in Annex 2.

3.2 Suggested improvements

After field testing the metrics and tools above, participants provided feedback and recommendations for improving their use to capture the various dimensions of the food environment.

ProColor

In general, participants found the application of the tool to be very straightforward. However, some concerns were expressed about the interpretation and scientific meaning of the calcualted scores. Participants suggested that seasonality should be considered when assessing fruit and vegetable diversity and should include both the cultivated and wild species available in the area under investigation.

ProDes

Based on the brief experience using this tool, participants suggested several recommendations and considerations for improvement. First, before using the tool, enumerators should be briefed about the

[10] Using the Food Based Dietary Guidelines for India as these are yet to be developed for Ethiopia.

produce under evaluation, as they may not be aware of the different species and varieties they are to evaluate. Second, the briefing should include simple rules to avoid subjectivity in providing the scores (taste preferences, personal experience, cultural factors, origin of produce etc.). Third, the rating would be more effective if switched from 'not desirable' to 'very undesirable' and from 'most desirable' to 'very desirable,' to better clarify negative, neutral, and positve assessments of the item being evaluated. Fourth, assessments should be performed under standardized considitions (e.g. adequate lighting) to avoid biased resuts. Finally, in countries like Ethiopia, produce is dependent on seasonality and it would be good to use this tool in different seasons to assess any differences in quality.

CoRD

Participants felt that data collection for this method was very straightforward. Caution needs to be taken with food items not sold in a standard unit (kg/g). For example, dry green leafy vegetables are sometimes sold by the bunch, the size of which can differ by season and availability, so attention to unit standardization is needed during data collection. The calculation of the score was also uncomplicated, but again, seasonal availability will influence price, and so seasonality should be noted as part of the interpretation of results. Finally, the cost of recommended diet does not consider food preferences, so for example, the cost might be calculated on a less-preffered staple grain, rather than the most commonly consumed or preferred foods. Participants requested information be made available on (1) how to convert price per kg into price per edible serving or price per day, and (2) how to select appropriate food-based dietary guidelines (FBDG), especially in countries that do not have their own national FBDG.

Photo documentation

In the field testing for the workshop, photo documentation was helfpul to contextualize the food environment (see Annex 2) and explain FE characteristics of the given geographical area. More effort is needed to standardize the method and apply more widely in FE research.

Another food environment aspect the group thought would be useful to capture was overall diversity of food items available in the retail environment. For example, it could be useful to count the diversity within food groups, using the ten food groups defined for Minimum Dietary Diversity for Women, but also including ultraprocessed foods (e.g. salty snacks, instant noodles) and sugar sweetened beverages and capturing whether these foods are available from natural or built food environments.

4. Stakeholders inputs

On the third and final day of the workshop, Ethiopian stakeholders were provided with an overview of food environment research, including examples of applications and measurement tools (ProColor, ProDesirability, Photo documentation, Photovoice). One presentation focused on the application of the INFORMAS module Healthy Food Environment Policy Index (Food-EPI) which has been used to analyze food environment policies in Ghana. These presentations were aimed at showing the relevancy of FE research for nutrition and health and to stimulate discussions on how this research can be translated into the Ethiopian context. Examples of the application of Cost of Recommended Diet tool followed in the afternoon. Preliminary results were based on food price data gathered from the field trip in Addis Ababa.

The presentation and discussion of FE tools and other FE examples from reearch was followed by a group discussion titled “How food environment research can contribute to improving nutritional outcomes in our food systems” (Figure 7). The session was moderated by Sarah Assefa from AgriproFocus Ethiopia. In this session, participants were divided into groups. Starting from main discussion points (in bold in Table 1), participants provided their input on what would be interesting to investigate further in food environment research in Ethiopia.

Table 1: Stakeholder inputs from the group discussion.

Discussion points	*Stakeholder input on areas of research needed*
Within our sphere of influence, how can we use the FE approach to strengthen our food systems development work?	• What parts of the FE approach are relevant and how can we use them? • How does the value chain approach relate to the FE approach?
What types of FE information do you wish to be generated through food environment research to improve your work?	• We should identify the three most urgent areas for which more FE data is needed. • With this new approach and new concepts, how do we approach looking at the FE, what methods and tools do we need to have and develop and consolidate and build agreement on? • Which indicators matter most? • How do the tools we have work in contexts such as rural Ethiopia, and what best practices are there for contexts such as rural Ethiopia?
How could FE information be used by programs and policy in your context?	• What are the legal boundaries and guidelines in your country, and what FE interventions might there be space for?

Overall, the reaction of the stakeholders was very positive toward including a research focus on FE. The stakeholders advocated for a greater focus on FE in rural areas and felt the FE characteristics between rural and urban areas would be very different. The stakeholders also said they felt the tools and research approach could incorporate more of a gender dimension. The stakeholders mentioned the importance of seasonality in interpreting the results of all of the tools as well as understanding and

documenting the culture practice of fasting, as this can have an influcence on food availability and price in markets.

Figure 7: Day 3 group discussion with local stakeholders.

5. Way forward

During the workshop, two sessions focussed on discussions to define the synergies and gaps across CGIAR centers and the way forward in FE research. In general, there was agreement that FE research is important and needed. There is a need to develop an agreed-upon set of terms to define certain retail typologies (for example informal, formal, wet market). Participants expressed their interest in exploring the FE typology presented during the workshop further and in getting more guidance\advice on the use of tools and methods.

5.1 Synergies and gaps in FE research

During Day 1, participants joined a group exercise which consisted in producing an inventory of the CGIAR programs activities around FE research. The aim of the exercise was to identify synergies and gaps across the CGIAR centers. Each group participant was encouraged to place a sticky note on a wall poster including the name of the CGIAR center, the country(ies) involved, and the main activities of the program (Figure 8). The notes were to be positioned under the corresponding component of the food system framework[11] (Consumer behaviour, Food environment, Supply chains, Drivers, etc.) in which the activities have been carried out.

Figure 8: Group exercise about the synergies and gaps in FE research across CGIAR centers.

At the end of this exercise, each group reported back their findings and considerations highlighting what are the main domains of research covered and the potential areas of collaboration across the centers.

- In general, all the food system components (Consumer behaviour, Food environment, Supply chains, Drivers, etc.) are addressed, but never as a complete set.

[11] Adapted from HLPE (2017).

- Within the FE component, most of the activities are focused on characterization and assessment; there are a few innovations to stimulate healthier diets within the food environment, however, there is no monitoring or evaluation of whether and how FE innovations contribute (or not) to healthier diets.
- There is a wide range of (useful) indicators, metrics and tools available, but these are under exploration, not well validated, and not harmonized.
- Activities are often focused on one food/food group of interest, rather than taking a diet approach, however, these activities seem to be driven by diet quality.

Several challenges have been identified. For example, participants were concerned about how to move from a single food focus to a whole diet approach, how to use FE assessments to inform FE interventions, and how to monitor and evaluate FE interventions (if not diet).

5.2 Priorities for research

During Day 2, there was a group discussion on priorities for FE research in CGIAR, based on synergies and gaps identified during the group exercise of Day 1. Participants divided into three groups, each discussing one of the discussion points below (Figure 9).

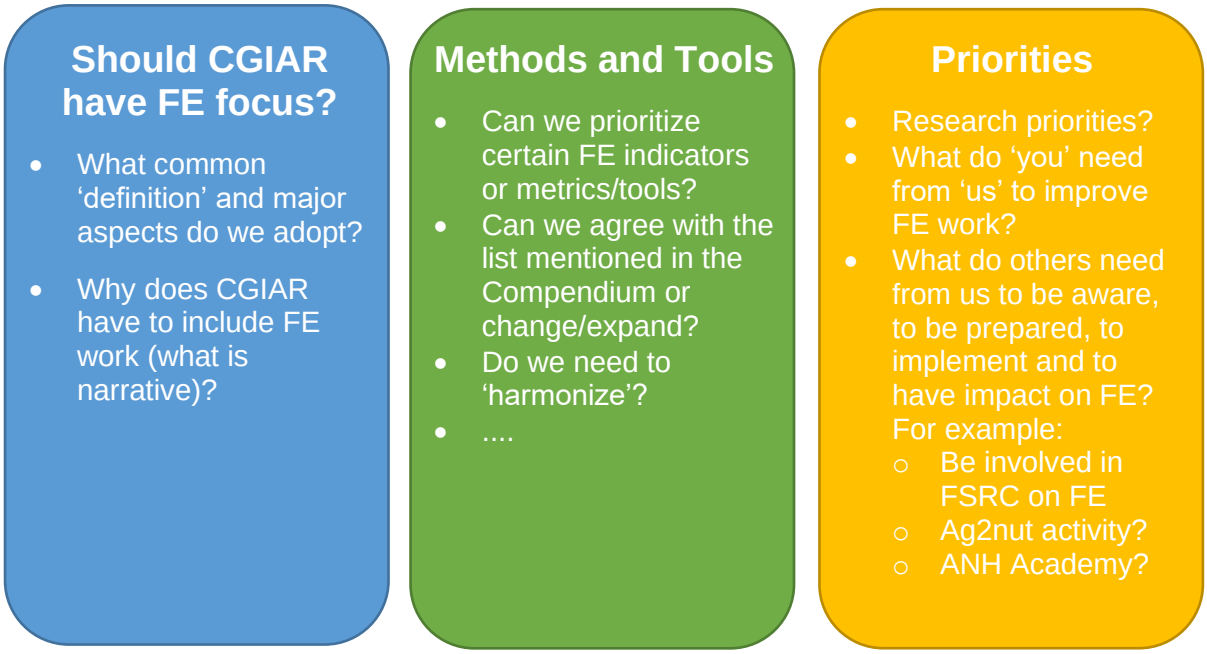

Figure 9: Next steps identified for planning a way forward in FE research.

Should CGIAR centers include FE research or focus?

The group agreed to define the food environment recognizing the major aspects expressed in the FAO (2016) and HLPE (2017) definitions: Food environments are the range of foods available in all venues where people produce and eat food. FE can both constrain and prompt healthier food choices (FAO, 2016). Policy and sociocultural aspects constantly shape the food environment, and individual factors, such as income, contribute to determine food access and diets (HLPE, 2017). Food environments consist of five components, which are: Food availability and physical access, Food prices and

affordability, Convenience and time savings, Promotion, advertising and information, Food safety and quality (adapted from the HPLE (2017) framework).

Moreover, food environments can be both wild and cultivated (natural), as well as informal and formal markets (built). In this context, sustainability aspects are important to consider across the different types of food environments (Downs et al., forthcoming).

Several questions were raised by group participants. They asked how FE research can be relevant for centers focusing on landscape approaches using the wild and cultivated food environment typology and whether the tools presented during the workshop are relevant for looking at FE aspects from a "landscape perspective." The group also discussed how investments and interventions may affect the availability and price of nutritionally recommended foods/diets and whether researchers (economists, breeders, etc.) understand these core aspects.

Food environment research is becoming more relevant as commodity centers move away from a single-commodity focus to systems approaches (e.g. rice to rice-based systems). In the context of CGIAR, it is important to consider that investments aimed at increasing the availaibility and reducing the price of one commodity, such as rice for example, may have implications on other nutritious foods and prices.

Several suggestions and considerations followed. First, as FE research has mainly focused on urban settings and HICs, participants suggested more research should be done to test FE methods and tools in rural areas, where CGIAR work has historically focused. Second, FE assessments can be adapted to measure the reliance on production and markets and how that varies over time and across seasons. Third, FE research in CGIAR may not require every CGIAR center to employ an FE expert, but may draw on other resources across and outside centers (people and organizations). Finally, research should focus more on specific commodities such as fruits and vegetables and other nutritious foods.

Methods and tools

In general, participants agreed that more work is needed to developing a standard set of definitions for food outlets across CGIAR centers to understand the linkages between the different types of retail and food consumption and diets.

Several considerations on the tools and methods tested during the worskshop were discussed. The Cost of Recommended Diet (CoRD) tool is highly feasible in food markets; but a question was raised about how to measure the cost of diets in rural communities where food is not purchased. It was agreed that the ProDes tools can be improved to avoid subjectivity and that the scale of values can be refined.

More guidance should be provided on who assigns the desirability scores for Produce Desirability tool. Should scores be assigned by researchers or consumers? There was also the feeling that the tool can be very subjective depending on the assesors' personal like or dislike of that food. Finally, the group discussed that time of day of assessment could change the results since unrefrigerated produce will degrade during the course of the day, particularly in hot and humid climates.

It was suggested that the school food environment can be a good model to study since there are fewer external factors to be considered.

There is a need to agree on a standardized nutrient profile across CGIAR, as sometimes there is no clear distinction between healthy and unhealthy foods.

Several considerations were shared about the Compendium, and some suggestions made to further expand the list of selected indicators, such as including indicators aimed at measuring access to fisheries and aflatoxin contamination.

Priorities

Group participants agreed there is research that has been carried out using several different methods and tools. Not all tools have been validated. Participants agreed that even if the food environment is characterized, tools and methods to analyze the data and how to interpret it are not clear. Moreover, tools that can monitor and evaluate interventions in the FE need to be further verified through testing in experimental settings.

Participants agreed that there are several priorities in FE research and that there is a need for:

- Validated metrics and tools for FE assessment;
- Agreed definitions of the natural and built food environment typologies;
- A community of practice for FE to discuss methods, metrics, tools, etc.;
- Links with other experts/expert groups including Anna Herforth, Selena Ahmed, Shauna Downs, and the Food Environment Working Group;
- Webinars or a series of communication on research in the area of the food environment (participants wondered if a place to start would be the Ag2Nut Community of Practice). The presentations can include some of the studies discussed in the Retail Diversity for Dietary Diversity project group (e.g. Veggies on Wheels etc.), but could also include others outside of "us";
- Developing joint proposals to carry out experiments on the food environment (e.g. IMMANA call for proposals);
- CGIAR centers willing to adopt MSc students working on the topic of FE within Ethiopia;
- More studies on food safety specifically looking at pesticides in foods and availability of clean water. In this regard, beyond aflatoxin contamination, research on antimicrobial resistance, (AMR) conducted by A4NH researchers as part of the CGIAR AMR Hub, and on foodborne diseases is currently going on;
- Include experts on food safety as part of workshops on the food environment;
- Organizing a learning lab on food environments at the June 2020 ANH Academy Week in Lilongwe.

Figure 10: Group picture of Day 3.

Annex 1

Agenda and Participants List

Tuesday, 5 November 2019

09:00 – 09:30	Welcome address Overview of meeting objectives and programme, introduction of participants	Gina Kennedy/Inge Brouwer
	What is food environment?	
09:30 – 10:15	What do we mean by Food Environment?	Anna Herforth
10:15 – 11:00	Food Environment typology and food environment transition over time	Shauna Downs
11:00 – 11:30	Coffee break	
11:30 – 12:30	Work groups: mapping food environment activities in the different research programmes: identification of synergies and gaps) Mapping work worked well in previous workshops – What areas do you have research and where? FE elements • Food availability and Physical access • Food Prices and affordability • Convenience and Time Savings • Promotion, Advertising and Information • Food Quality and Safety Anna/Shauna/Gina as facilitators	Gina Kennedy
12:30 – 13:00	Groups report back	Gina Kennedy
12:45 – 14:00	Lunch	
14:00 – 14:45	Overview of metrics and tools in FE research Methods that exist – grouped along 6 categories	Shauna Downs Anna Herforth
14:45 – 16:00	**Field examples of Food Environment measurement: 6-7 examples (10-minute presentations)**	
	Photovoice (Ethiopia)	Ursula Truebswasser
	RD4DD (Vietnam)	Gina Kennedy
	Retail Diversity Index	Inge Brouwer
	Cost of Diet	Anna Herforth Haleluya Tesfaye
	Fill the Nutrient Gap	Zebibba Ayenew
	ProDES (tool to assess quality of foods)	Selena Ahmed (via video)
16:00 – 16:30	Coffee/tea break	
16:30 – 17:30		

	Discuss methods and logistics for the field trip planned for Wednesday morning	
	Wednesday, 6 November 2019	
08:30 - 12:30	Field trip to test FE measurement tools in Addis	
12:30 - 14:00	Lunch	
14:00 - 15:00	Groups work to analyse/summarize findings from field trip	
15:00 - 15:30	Coffee/tea break	
15:30 - 16:15	Open discussion - what are the priorities for FE research in CGIAR - most critical next steps	Gina Kennedy
16:15 - 17:00	Summary and insights to be shared with stakeholders during Day 3	Inge Brower
17:00	Closure	
	Thursday, 7 November	
09:00 – 09:30	Welcome Overview of meeting objectives and programme, introduction of participants	Gina Kennedy/Inge Brouwer
09:30 – 10:30	What do we mean by the Food Environment and overview of measurement tools	Anna Herforth
10:30 – 11:00	Coffee break	
11:00 – 11:30	Policy example INFORMAS in Ghana	Amos Laar (via video)
11:30 – 12:30	Measurement examples from Ethiopia • ProColor • ProDesirability • Photo documentation • Photovoice	Mestawet Gebru Micheal Tedla Gina Kennedy Ursula Truebswasser
13:00 – 14:00	Lunch	
14.00 - 14.30	Cost of Diet work in Ethiopia Examples from the field trip	Anna Herforth
14:30 – 16:00	Group discussion on why FE research could be helpful • What are the most urgent FE issues in Ethiopia? • Within our sphere of influence, how can we use the FE approach to strengthen our food systems development work? • What types of FE information do you wish to be generated through FE research to improve your work? • How could FE information be used by programs and policy in your context?	Sarah Assefa
16:00 – 16:30	Coffee break	
16:30 – 17:00	Feedback discussion	Sarah Assefa
17:00	Closure and networking reception in ILRI garden	Gina Kennedy

Participants list

Day 1 and Day 2

No	Name	Institution	Email contact
1	Amy Icowitz	CIFOR	a.icowitz@CGIAR.org
2	Anna Herforth	Independent consultant	anna@herforth.net
3	Anne Bossuyt	IFPRI-NIPN	a.bossuyt@CGIAR.org
4	Barbara Stadlmayr	ICRAF	b.stadlmayr@CGIAR.org
5	Betelihem Girma	Addis Ababa University	betelih22emgirma@gmail.com
6	Beza Kifle	Addis Ababa University	begreen1221@gmail.com
7	Elise Talsma	Wageningen	elise.talsma@wur.nl
8	Filippo Di Bari	WFP	filippo.dibari@wfp.org
9	Francis Oduor	Bioversity-Kenya	F.oduor@CGIAR.org
10	Gina Kennedy	Bioversity	g.kennedy@CGIAR.org
11	Giulia Rota Nodari	Bioversity	g.rotanodari@CGIAR.org
12	Inge Brouwer	Wageningen	inge.brouwer@wur.nl
13	Kendra Byrd	WorldFish	k.byrd@CGIAR.org
14	Lieven Huybregts	IFPRI	L.huybregts@CGIAR.org
15	Marie Claire Custodio	IRRI	m.custodio@irri.org
16	Mestawet Gebru	Bioversity	m.gebru@CGIAR.org
17	Michael Tedla Diressie	Harvest Plus	m.t.diressie@CGIAR.org
18	Selamawit Ekubay	AAU	s.ekubay@CGIAR.org
19	Shauna Downs	Rutgers School of Public Health	sd1081@sph.rutgers.edu
20	Stepha McMullin	ICRAF	s.mcmullin@CGIAR.org
21	Ursula Truebswasser	Wageningen	utruebswasser@gmail.com
22	Wanjiku Gichohi	ICRISAT	w.gichohi@CGIAR.org
23	Zebibba Ayenew	WFP	zebiba.ayenew@wfp.org

Day 3

No	Name	Institution	Email contact
1	Alberto Giani (Dr.)	FAO	alberto.giani@fao.org
2	Alemayehu Ayalew	Local entrepreneur	ruthbezaa@gmail.com
3	Amleset Haile	CASCAPE	amlihaile@gmail.com
4	Frew Takebe	WorldBank	ftekabe@worldbank.org
5	Getamesay Behailu	EPHI	g_behailu@yahoo.com
6	Hanna Berhane	Addis Continental University	hannayaciph@gmail.com
7	Lisan Bijdevaate	Netherlands Embassy	lisan.bijdevaate@minbuza.nl
8	Maya Hage Ali	FAO-Ethiopia	maya.hageali@fao.org
9	Seifu Hagos Gebreyesus	Addis Ababa University	seifh23@yahoo.com
10	Selamawit Firdissa	BENEFIT	selamawit.benefit@gmail.com
11	Tenaw Tadege	FAOSEF	tenaw.tagede@fao.org
12	Vincent Ndayambaje	FAO	vincent.ndayambaje@fao.org

Annex 2

Summary of photo documentation

During the field trip on Day 2, photo documentation was conducted with the aim of capturing the food environment in a more visual way, to enrich the data collected through the various tools. To do this, we selected various settings where people usually acquire food such as markets (Shola and 'Church'), roadside stands and one supermarket (Shi Abebayuhu). The supermarket, the roadside stands and 'Church' market are within walking distance from the ILRI campus, whereas Shola market is 30 minutes driving distance (depending on traffic).

The pictures were grouped following the 'key elements' of the food environment adapted from the HPLE (2017) framework.

Food availability and physical access

These pictures show the range of foods available and accessible in the different food outlets of the area investigated. For example, we noticed that Shola market mainly offers vegetables, grains, pulses, eggs and vegetable oil, and very little or no fruits, compared to Church market where these are more available. Fruits are also available in the supermarket or at the many roadside stands. Dairy and meat products were found to be available in the supermarket only and to be missing in the markets, with the exeption of Shola where live chickens are sold (See convenience section below) (Figure 11).

Figure 11: Up from left to right, a stand selling vegetables in Shola market; a butchery stand in the supermarket; a dairy products stand in the supermarket. Down from left to right, a stand selling grains, pulses and vegetable oil in Shola market; a stand selling fruits in Church market; roadside stands selling bananas.

Food prices and affordability

Prices are rarely displayed on food products and need to be asked of the vendor. For this reason it has proven difficult to capture the economic access through photographs. However, we noticed there were price differences based on where the stand is located within the market. Indeed, vendors, whose stand is positioned on the road side of the market sell their products at higher prices compared to those residing more internally and selling their products on the ground (Figure 12).

Figure 12: On the left, a stand selling grains and pulses on the road side of Shola market (entrance). On the right, grains and pulses sold on the ground in the internal side of the same market.

Convenience and time savings

These pictures from Shola market aim to capture some convenience and time savings aspects. In general, the market mainly offers fresh foods, but there are also some convenient and ready-to-prepare foods such as spiced sciro powder (mixed powders of chickpeas and chili pepper), dried engera and enset. Enset is sold in plastic bags as a powder (white bags) or as a paste (pink bags). According to the vendor, the powder requires less time to cook compared to the paste and for this reason it is more expensive. We noted it was possible to buy smaller portions of large-sized vegetables such as pumpkins. This can be considered either as a convenience aspect (less weight to carry) or an affordability aspect (smaller quantities are more affordable). Furthermore, buying a portion instead of the whole piece can be convenient, especially when storage facilities are missing in the household. However, the same was not possible for chicken which could not be sold in parts (Figure 13).

Figure 13: Up from left to right, spiced sciro powder; dried engera; a vendor preparing/selling pumpkin slices. Down from left to right, enset powder (white bags) and enset paste (pink bags); live chickens for sale. All the pictures were taken in Shola market.

Promotion, advertising and information

These pictures show some advertisements for products such as instant noodles, seasoning cubes, and vegetable oil found in the area of Shola market. Packaged foods are not very common in Shola market, but some packages have simple labels (e.g. preparation and expiry dates, producer information and contacts, batch number). Food labelling and brand recognition is probably more common in supermarkets. However, it has proven difficult to document these aspects as taking pictures was often not allowed inside supermarkets (Figure 14).

Figure 14: Up from left to right, advertisements poster about: instant noodles; seasoning cubes. Down from left to right, packages of dried beans; vegetable oil.

Food quality and safety

These pictures capture some food safety aspects of the food sold in Shola and Church markets. For example, we noted rotten produce left in the drainage system alongside the market stands, the enset paste being sold in a bag meant for fertilizers, and fresh produce and pre-cut pumpkin sold on the ground withouth any protection from external contaminants (e.g. dust, insects) (Figure 15).

Figure 15: Up on the left, fruits and vegetables in the drainage channel ('Church' market); Down on the left, fresh produce sold on the ground; Center, enset paste sold in a urea bag; On the right, pre-cut pumpkin sold on the ground (Shola market)
.