Progress in African Food Systems: What do the Data Say?

GAIN-AGRA Draft report for 2022 AGRF
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INTRODUCTION

The mindset of food leaders the world over has changed as a result of the UN Food Systems Summit (UNFSS) of 2021. Food Systems represent a new framing for food, including decisions—on what to eat, how to prepare it, how to acquire it, how to advertise and market it, how to process, store, and transport it, and what to grow, where, by whom, and how—that are connected to each other in food systems. This makes policy related to food the remit of many ministries and agencies, with the challenge of alignment and coherence, but also generates more opportunities to act, actions that can leverage others and generate powerful positive feedback loops for a range of key outcomes for people, planet, and prosperity.

African leaders are at the forefront of this evolution. Governments and institutions are taking on bold new objectives and layering previous goals of scale and productivity with new ambitions for social and environmental resilience. If built to last, food systems can improve food security, reduce poverty, fuel healthy populations, secure equitable livelihoods, regenerate environments, and produce resilient economies. (Caron et al. 2018) The longstanding focus on boosting production to "feed" people is moving towards a more holistic and sustainable objective: empowering and enabling populations to *nourish* themselves. (Haddad et al. 2016)

With newfound sensitivity to nutrition, and a growing commitment towards sustainability and regenerative practices—leaders in the agriculture space are shifting gears and beginning to grapple with food systems as a whole. At the same time, governments are confronting the complexity and fragility of their food systems—and business as usual is increasingly challenged by the growing effects of climate change, the ongoing Covid-19 pandemic, and conflicts like the war in Ukraine that can wreak havoc on livelihoods and derail the movement of key commodities. In many places, this storm of powerful forces threatens to stall—or in some cases, rewind—decades of hard-earned progress. To sustain a burgeoning population rate within planetary boundaries, the trajectory of food systems must be changed, and guided towards a more equitable, sustainable, and resilient future. (Fanzo et al. 2021)

Transformation is urgent, but there are few coordinated efforts to monitor all drivers, domains, and outcomes of our food systems—and even less that are committed to studying their interactions. (Fanzo et al. 2021) To help guide food systems towards the pathways governments have outlined, a range of indicators need to be charted.

In a world of commitments, goals, and objectives, what cannot be measured, cannot be managed. New food system monitoring mechanisms are needed, but without reinventing the wheel. The Food Systems Dashboard (FSD) is the most comprehensive effort to gather, screen, organize, and link a large set of existing food system indicators for all countries, including the 55 in Africa. Existing African initiatives to track progress and identify food system opportunities and challenges offer valuable lessons to all regions of the world and can be further enhanced through the use of the FSD. With visibility on supply chains, food environments, nutrition outcomes, and environmental sustainability—the Dashboard can support the robust monitoring of food systems from farm to fork.

In anticipation of the 2022 AGRF, the Global Alliance for Improved Nutrition (GAIN) and the Alliance for a Green Revolution in Africa (AGRA) have leveraged their existing partnership to produce this report to provide African leaders with cutting-edge data tools that can be employed to *describe* their nation's food systems, *diagnose* the most urgent areas for action, and *decide* which evidence-based solutions best suit their needs.

Intended to introduce new innovations in the sphere of food systems data, this report offers a window into publicly available and easy-to-use monitoring functions using the FSD. In doing so, the report takes the first step to apply these tools to the African context.

The report consists of two linked parts. The first part describes the FSD and applies it to African countries. The second part discusses the implications of the work for on-going efforts to embed the monitoring of food systems within African institutions, such as the Comprehensive Africa Agriculture Development Programme (CAADP).

Part 1: In part 1, the report provides a broad overview of the FSD—its current scope of indicators and methodology, as well as its dual capacity for both big picture insights and granular deep dives. Built for policymakers and business leaders alike, the platform helps illuminate the path from raw data to decision-making. (Marshall et al. 2021) It then describes the FSD's alignment with the current accountability landscape, highlights the novelty it brings to the table, and explores ways that it can serve Agenda Africa 2063 while drawing lessons from global frameworks (like the 2030 SDGs). Next, part 1 offers a preliminary application to African food systems, taking a regional perspective and considering correlations with economic drivers like income. It then takes stock of continental patterns by exploring food systems domains that show progress, and underlines trends that may require more attention and investment from African leaders. The final section considers implications for taking action, for strengthening monitoring systems, and for bolstering accountability mechanisms. So, part 1 of this report uses the most comprehensive global resource, the FSD, to illustrate the kinds of indicator domains, indicators, performance benchmarks, and analyses that the CAADP initiative could consider in its journey to incorporate and align food system targets and indicators into the *Biennial Review* (BR).

Part 2: The second part of the report focuses on the CAADP initiative to expand the current set of indicators and targets monitored. Through an inclusive process, the CAADP BR can absorb additional data and leverage new performance metrics to create a more harmonized continental monitoring process. Gaps and mismatches between UNFSS priorities and existing BR indicators are discussed, with an exploration of how the FSD's datahub can support future integration efforts. Part 2 of the report reflects on the unique potential of the BR to connect the dots for African leaders and guide evidence-based planning and investment. Finally, it highlights the momentum to steer agricultural agendas towards a more holistic food systems approach, and identifies concrete ways that analytics can help to address malnutrition in all its complexity, thereby enhancing agriculture's impact on nutrition. In this regard the report makes some propositions for the AGRF community to discuss.

The goal of this report is to empower policymakers, businesses, and civil society who operate in and help shape food systems across 55 African countries. With the unique AGRF community, the insights here can be used to accelerate progress towards Malabo Commitments and SDGs alike in a way that both celebrates the continent's rich biodiversity, recognizes its landscape of culinary traditions, and harnesses its agricultural potential to bring healthy diets within reach of all people.

PART 1

1.1 Methodology

With many causal feedback loops, food systems are complex. On one side of the equation, many drivers feed these food system components, including economic factors, political decisions, and climate change. On the other side, food systems cause considerable ripple effects across populations and places they touch—shaping the health and nutrition of individuals, and impacting the environment they operate in.

Today's landscape of food systems data requires a dynamic, responsive platform that can integrate data from different sources and offer users a well-rounded view of their food systems, the drivers, and related outcomes. Much work has been done to improve the availability of nutrition, health, agricultural, environmental, and economic data; but more often than not, these domains remain siloed in separate portals—making it difficult for decision-makers to connect the dots across multiple interconnected components of the food system. The FSD is a novel attempt to integrate data across domains, guide prioritization, and empower countries to make data-driven decisions to positively transform their food systems.

The idea for the FSD came about in 2018 from GAIN, with the dual ambition of capturing the complex realities of food systems, and translating the vast constellation of data into practical, actionable insights for country leaders in all nations. Providing a holistic view across the many drivers, domains, and outcomes of food systems required a collaborative approach. The core team—co-led by John Hopkins University and GAIN— brought together a multi-disciplinary group of experts to design the framework (see Figure 1) and create a rigorous methodology for populating the portal with data.

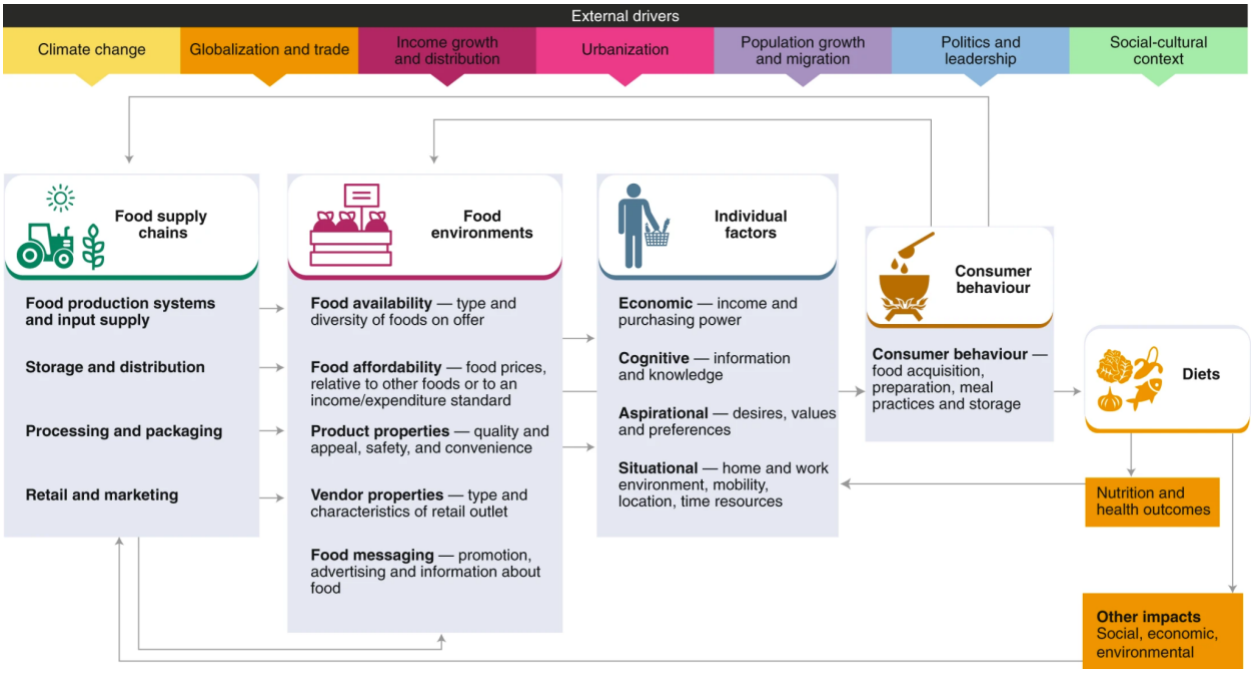


Figure 1. The food systems framework behind the Food Systems Dashboard. (Fanzo et al. 2020) Demonstration of the interconnected nature of external drivers, food systems components, and health, social, and environmental outcomes.

The process entailed establishing clear thresholds and criteria for data inclusion, ensuring that indicators are vetted and redundancy is accounted for. From the beginning, the power of comparison was deemed a core element of the dashboard, giving priority to the indicators that have existing data that are available across 50+ countries. This inclusion criteria ensured that featured data was both relevant to countries, broadly applicable across regions, and useful for global analysis of trends. In June of 2020, the first iteration of the FSD was launched, summoning over a hundred key indicators from public and private sources, and embedding them in a framework that illuminated how different sectors—agriculture supply chains, distribution infrastructure, food environments, consumer behavior—push and pull the food system. (Fanzo et al. 2020)

Food Systems Dashboard: Describe

Today's FSD pools 200+ indicators for 230+ countries and territories and bridges over 40 extant sources—including datahubs from FAO, WHO, UNICEF, the World Bank, Global Burden of Disease, Climate Watch, and Euromonitor. Offering country-level, regional and global insights, the FSD is designed with a range of stakeholders in mind: policymakers and policy analysts, ministries and national statistical agencies, business leaders and entrepreneurs, academic researchers, development partners, NGOs, and UN agencies. (Fanzo et al. 2020).

The FSD has three key functions: to *describe* food systems, to *diagnose* challenge areas and to help policymakers *decide* how to meet these challenges.

The FSD provides a new way to **"describe"** food systems. It offers users three windows for interacting with the data. (see Figure 2) The "Global Data" feature is a geographic approach that gives users the opportunity to navigate food systems indicators through a world map, graph, or table. This view enables comparisons across countries globally, and brings to light patterns across regions. The "Country Profile" feature gives users a closer look at individual countries through a curated set of informative graphs. This empowers users to take a magnifying glass to their own national food systems, and toggle optional benchmarks to compare against regional and global averages for select indicators. The final view—"Compare"—allows uses to compare components of food systems across countries and regions to better tease out relationships between variables.

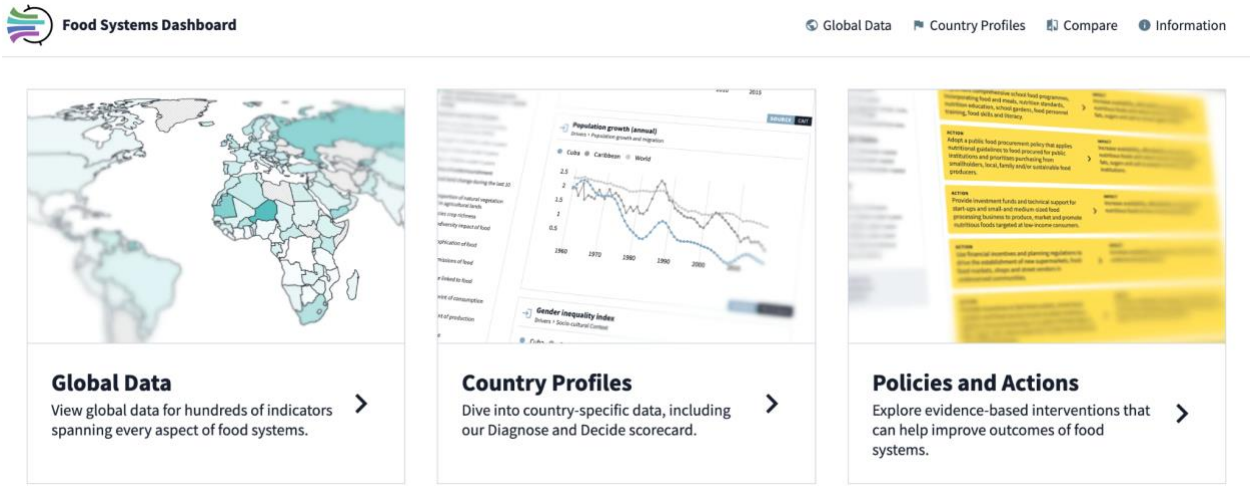


Figure 2. A view of the Food Systems Dashboard, where users can interact with food systems data.

With a dual capacity to analyze global and regional trends and dive deep into country-level granularity—the FSD is the most comprehensive way to procure data from farm to fork. Users are given a clear view of the food systems drivers and realities, while capturing the outcomes that food systems may have on the people and places in their orbit. The clear quality standards helps to ensure a vetted data environment, and the user-friendly interface enables easy locating of relevant food systems indicators and understanding of interactions between them.

Food Systems Dashboard: Diagnose

Beyond offering better visibility, the FSD has just launched a second tool for users: **"diagnose"**. This development was born from the recognition that even with good data and proper figures to summarize them, decision-makers are too often in the dark about where to start. (Herforth et al. 2022) Taking stock of food systems indicators can present as a daunting task, and in many cases, a mechanism is necessary to help users prioritize problem areas and decide where to focus their energy.

The country "diagnose" tool is the result of an expert-driven methodology to select the most relevant indicators and establish a system of cutoffs to determine how different sectors of a country's food system are performing—whether they are facing a likely challenge area, a potential challenge area, or are altogether unlikely to face a challenge in their food system for a given metric. A total of 39 indicators were selected for the approach, all meeting the criteria of being globally accepted, having recent data, and lending themselves to assessment through universally applicable targets. These indicators were selected to represent four key domains of the food system: (1) food supply chains, (2) food environments, (3) nutrition outcomes, and (4) environmental outcomes. This curated set of indicators (**see Figure 3**) was built to offer leaders a holistic snapshot of how their national food systems are performing.

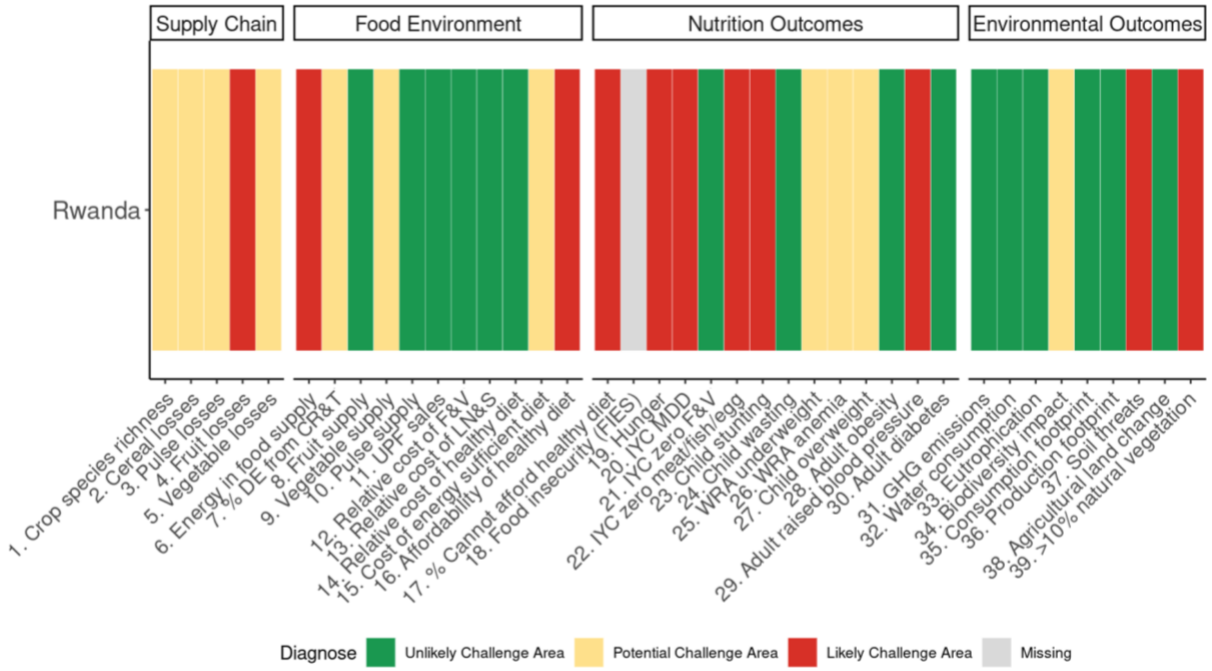


Figure 3. Food systems performance of Rwanda, using the "diagnose" tool from the FSD. Full indicator names and list of contributed indicators in Table 1, under Supplementary Materials section.

This curated set of indicators enables a comprehensive yet manageable approach—yielding a diagnostic scorecard that can be used to reorient food systems towards the delivery of healthy diets, the stewardship of ecosystems, and an evidence-based accountability mechanism for governments to employ. (Herforth et al. 2022)

For ease-of-use, the "diagnose" tool uses a traffic-light infographic. This color-coding for "unlikely", "potential", or "likely" challenge areas generates a quick view of where problem areas may be concentrated, and acts as a useful summary for decision-makers. The cutoffs in this scheme use performance thresholds that have either been established by global consensus, or have been developed through a rigorous, transparent process. (**see Box 1**)

Box 1. "Diagnose" Cutoff Targets

To diagnose low to high likelihood of challenge areas for each country, which can feed the decide feature of recommended policy actions, the "diagnose" tool uses a transparent system of performance cutoffs for different food systems indicators. To ensure that these thresholds are valid, the FSD team has taken a three-prong approach: (1) where published or pre-established cutoffs of public health significance exist, the tool has followed global consensus, (2) where normative *recommendations* are available, they have been leveraged to create cutoffs (i.e. the global recommended per capita intake of fruit was used to determine thresholds for fruit supply adequacy), and (3) for indicators with no pre-existing thresholds or global recommendations, the distribution of global data (data from all countries where it is available) was leveraged to create transparent and interpretable cutoffs for each tertile—likely, potential, or unlikely challenge area. (Herforth et al. 2022)

In most cases, pre-defined cutoff values (with global consensus) do not exist. The "diagnose" tool is the first global effort to fill this gap and establish possible cutoffs for a large suite of indicators that can be used to assess country food systems performance. For indicators that have no pre-existing performance cutoffs or normative recommendations, **Figure 4** below offer examples of how the FSD "diagnose" tool established thresholds.

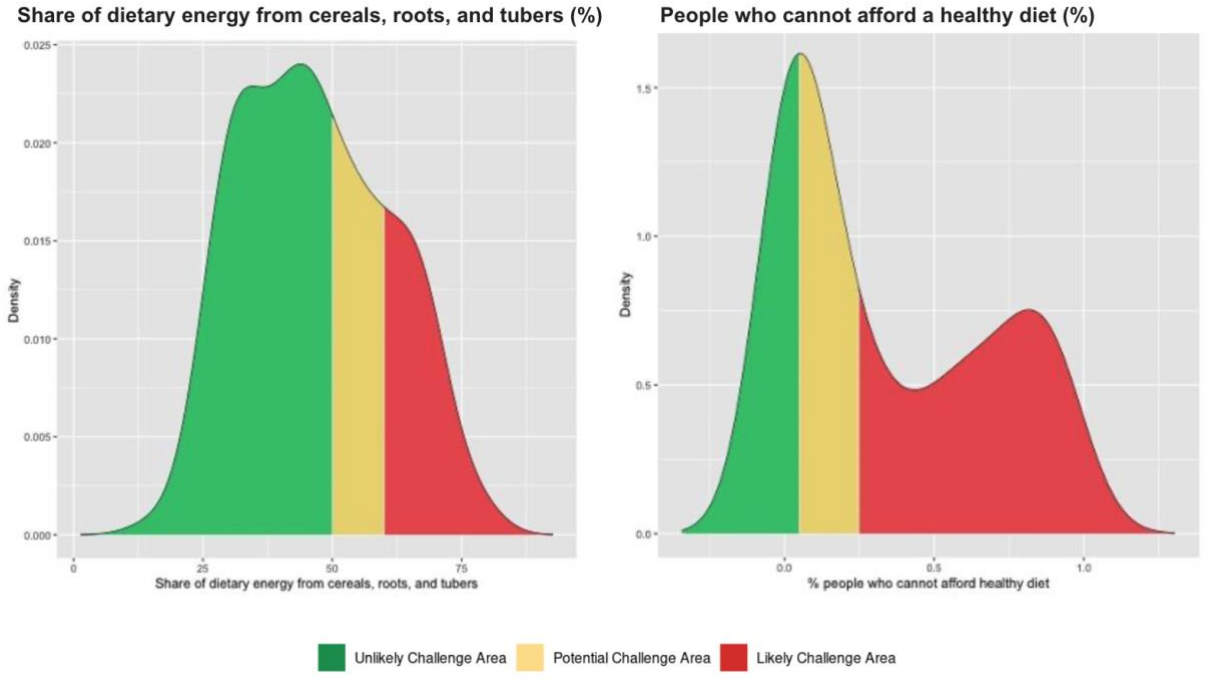


Figure 4. Density plots for how the FSD "diagnose" tool established thresholds.

The density plot on the left—for indicator Share of dietary energy from cereals, roots, and tubers (%)—shows that global data (from 168 countries) has a normal distribution, which was divided into tertiles for performance. Where

possible, meaningful cutoffs with easy-to-interpret values were prioritized over *exact* tertiles. The density plot on the right—for indicator People who cannot afford a healthy diet (%)—shows that global data (from 141 countries) has a bimodal distribution, where one of the peaks is bifurcated by two cutoff points.

For all cases, analysts can explore the sources and take a closer look at the established targets for a given indicator, as well as the logic behind them. To see detailed information on cutoffs (including methods to set them) for all 39 indicators used in the FSD "diagnose" tool, please refer to **Table 1** in Supplementary Materials.

As a starting point for analysts, policymakers, and other stakeholders, this tool can motivate further inquiry through other indicators. In addition to these 39 indicators lie 150+ others on the FSD, many of which can be tied to or help elucidate the "diagnose" results. This process can serve to confirm or challenge assumptions about country food systems, and encourage a thorough, second look at existing policies that may not be grounded in the latest evidence. Finally, the "diagnose" tool can also serve as a necessary compass for exploring the range of policy options a nation can adopt to improve its food system.

Once released, this tool will allow public agencies, research institutions and private entities to suss out and prioritize areas for action. With transparent targets and curated metrics, the "diagnose" feature helps to provide stakeholders the guideposts they need to assess national and regional food systems and direct the flow of resources in the most prudent direction. This creates new information that can be used to generate actions and form decisions on where and how to intervene in food systems.

Food Systems Dashboard: Decide

As its final functionality, the FSD now explicitly helps users to make decisions (**"decide").** This innovation offers stakeholders a customized starting point for building food systems transformations pathways. Using insights from the diagnose tool, it automatically generates a list of relevant solutions for the unique challenges faced by each country (**see Figure 5**). These solutions can be further tweaked and tailored by countries to generate culturally appropriate and inclusive interventions. Solutions can also be combined for a potent policy package to address a variety of problem areas. By linking the country metrics to a curated list of interventions, resources like FSD's "decide" feature (**see Box 2**) offer a matchmaking service between food systems performance and food-fixing policies. Agencies, ministries, and institutions that default to agriculture solutions now have the guidance to build holistic solutions that can improve both the health of populations and environmental outcomes in their country. Decision-makers are empowered to understand their food systems across multiple sectors so they can readily identify the best levers of change, and decide which ones to pull.

While the FSD "decide" feature can create a curated list of policy recommendations, there are other resources that can point stakeholders towards context-specific solutions that have been piloted or implemented at country-level. One example is the Innovative Food Systems Solutions (IFSS) Portal, which is an interactive registry of tried-and-true food systems solutions—including policies, technologies, initiatives, and public-private collaborations—with useful filters that let users explore initiatives to find the best fit(s) for their context.

Box 2. Identifying Policy Solutions

Countries have unique contexts, with different sets of challenges—but each government has the capacity to open specific pathways towards healthier diets and food security, even with existing resources. Once governments become acquainted with the interconnected nature of all sectors and domains that surround food, they can design interventions at the production end (ex. agricultural supply chains, processors, markets, and other food environments) that generate big wins for the health of their populations and ecosystems alike.

Figure 5 below shows the complementary "diagnose" and "decide" features on the FSD via Mali's food system—with recommended policies and actions shown for the "Cereal Losses" indicator. These features are available as part of the FSD's new interface (launched in September 2022), and can be used as a helpful starting point for identifying no-regrets actions based on the specific challenges faced by each country.

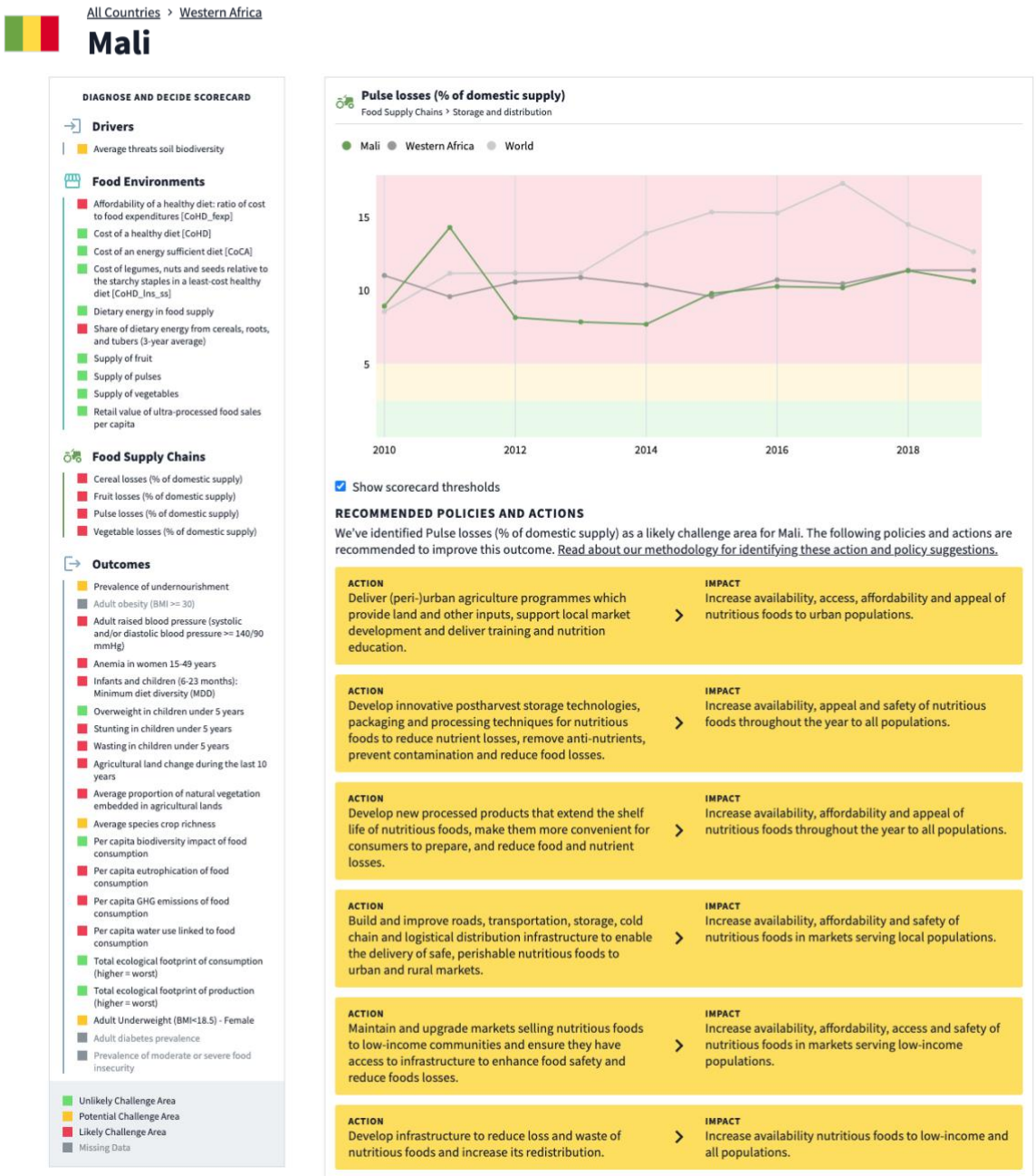
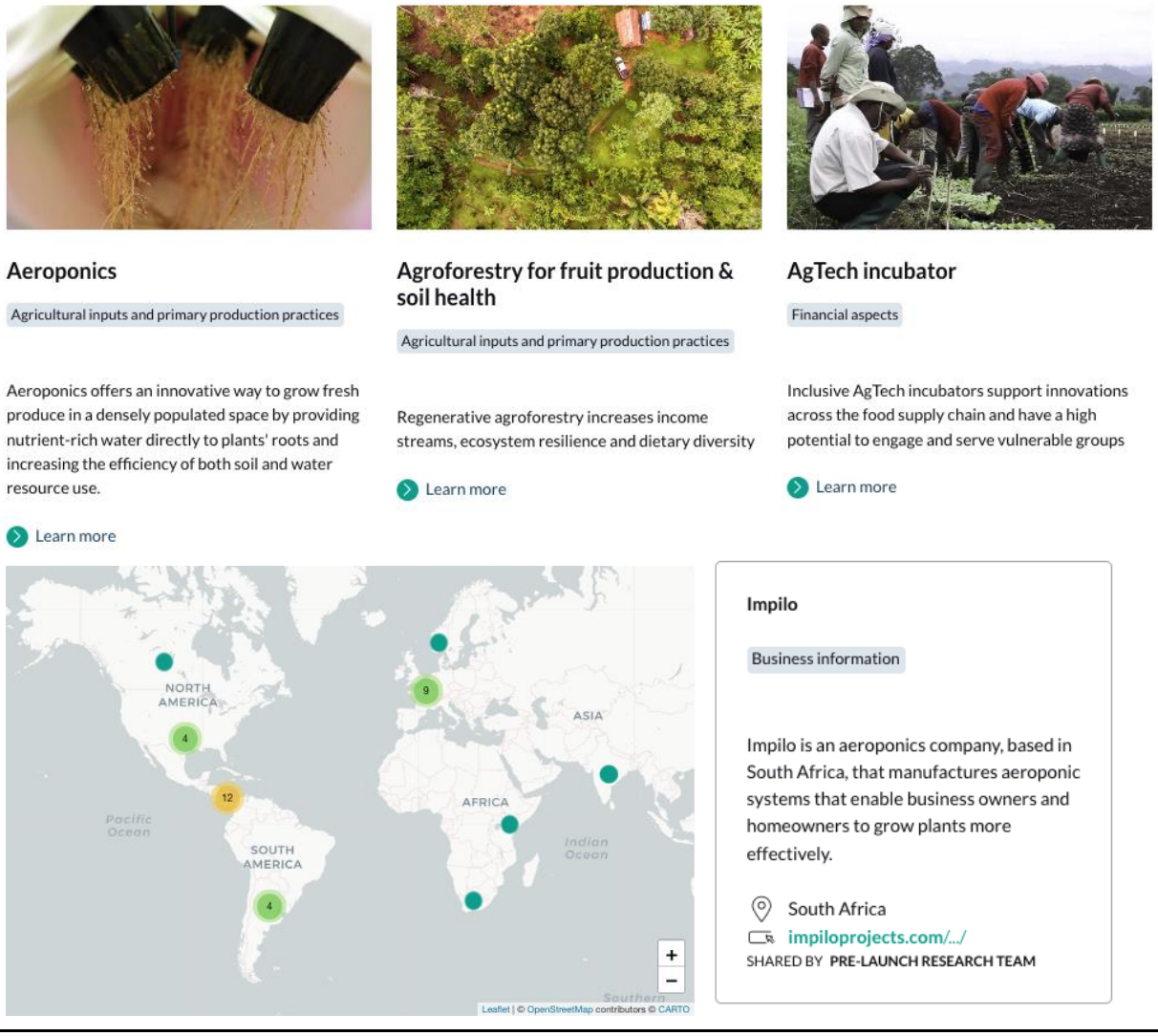


Figure 5. Example of the FSD "decide" feature for Mali.

Together, these new “diagnose” and “decide” features provide users with a comprehensive assessment of challenge areas in their food systems, alongside a menu of relevant and evidence-based solutions. Powered by the longstanding “describe” function of the FSD, these innovations can reduce blind spots, help leaders understand interconnections across sectors, track progress, perform comparisons with neighboring nations, and prioritize actions to improve food security for all.

In addition to the FSD, the IFSS Portal can be used to identify food systems solutions. With useful filters for country, context, SDG targets, and more, users can pinpoint policies that best suit their nation’s suite of food system challenges. They can search for solutions that address specific segments of the supply chain, read about real-world applications, view the range of impacts (i.e. dietary, planetary, equity), and have transparency into the main concerns and obstacles of each policy.

The screenshot below shows how results appear when specific criteria are selected, though users can also choose to see potential policies through a map-view to understand where implementation has taken place. The IFSS Portal also has a “backcasting” tool to help users understand the range of step-by-step pathways that can be pursued to achieve desirable impacts. This offers further guidance on the roadmaps needed for moving a solution towards uptake.



1.2 Alignment with the Accountability Landscape

Existing Accountability Initiatives and Mechanisms

The current landscape of accountability measures, tools and techniques is vast, offering a wealth of lessons for the future. (see **Figure 6**) Food systems, in particular, have been monitored in a myriad of ways: both with the north star of international targets—including the 17 global SDGs—and through regional frameworks, such as the 7 key commitments of the Malabo Declaration. While the UN's 2030 Agenda for Sustainable Development casts a broad net of economic, social, and environmental goals, Africa's Agenda 2063 offers a context-specific roadmap that acknowledges the continent's unique challenges and opportunities. At the national level, many countries have some form of a multi-sectoral nutrition strategy, and all of AGRA's focus countries have co-built a strategic plan for agricultural growth and transformation.

	Food system focused?	Multi-outcome or single focus?	Considers private sector and policy?	Coverage of all countries in Africa?	Performance thresholds for indicators?	Links to candidate actions?	Features easy to use data interface?
Food Systems Dashboard	yes	multi-outcome	limited	yes	yes	yes	yes
CAADP Biennial Review	partial	food security focus	yes	43	yes	yes	no
Continental Nutrition Accountability Scorecard	no	nutrition focus	partial	yes	yes	yes	no
Global Nutrition Report	no	nutrition and food security focus	no	yes	limited (outcomes only)	partial	yes

Figure 6. Summary of current food systems, nutrition and/or agriculture accountability measures and tools. Considers the following: food systems focus (whether a holistic food systems approach is taken), multi-outcome or single focus (coverage of multiple food systems outcomes such as nutrition, hunger, livelihoods, environment, etc.), private sector and policy considerations (whether tools take stock of business performance and government initiative), coverage of African countries, performance thresholds for indicators (clear targets and methodology for scoring mechanisms), links to candidate actions (recommendations for improvement), and availability of data interface (capacity to interact with data in a dynamic way).

CAADP operates as Africa's principal framework for agricultural transformation—seeking pathways towards food security, improved nutrition, economic growth and wealth creation across the continent. CAADP's BR, with three publications to date, has built considerable momentum for keeping countries accountable to the Malabo Declaration.

With African ownership and leadership as a guiding principle, the report follows 47 indicators on progress and planning from public and private sectors, and offers pathways for other monitoring systems to consider policy introduction and investments as key metrics for food systems success. Finally, CAADP's work understands the value of peer learning and regional complementarities—and through its reporting, promotes African developments that can offer lessons or blueprints for other countries.

Another key mechanism for tracking progress across the African context is the *Continental Nutrition Accountability Scorecard.* Developed in 2019 through joint efforts from the African Union and the African Development Bank, the scorecard puts nutrition outcomes front and center, and offers an advocacy tool to support African leaders in their efforts to combat the continental burden of malnutrition. The scorecard oversees 12 nutrition indicators via regularly updated metrics from the WHO, World Bank, and UNICEF among others, and positions them as key steps for social and economic prosperity in the African context.

Country-level policies offer a rich source of insights for designing relevant, tailor-made accountability strategies and embedding them in governance systems. Rwanda's celebrated system of *Imihigo* creates "performance contracts" that leaders must commit to and share publicly for the purpose of accountability and transparency.

Several other monitoring mechanisms operate on a global scale, including the annual *Global Nutrition Report*—providing an independent, comprehensive review of the state of nutrition across countries, with yearly updates on diets and their outcomes. In the coming years, the UNFSS Coordination Hub will also serve as an inter-agency catalyst for food systems change, under the guiding compass of the 2030 Agenda. While steered through global mechanisms, the Hub will prioritize country-owned and demand-driven approaches—and leverage UN presence in countries to bolster national platforms and empower government partners to spur food systems change.

Current efforts to create accountability across food systems are promising—many are built for regional use, while others are designed to address specific challenge areas. These specializations create a rich environment for sharing lessons learned, and many of these monitoring systems can offer a great deal of insights into one another. With willing exchange and cross pollination, their efforts can become complementary and tried-and-true methods can be adapted across countries. The FSD sees its work as parallel and complementary to the ongoing work of AGRA, CAADP, and the African Union, and is prepared to provide a one-stop-data resource for stakeholders working to transform African food systems.

The Novelty of the Food Systems Dashboard

The FSD is unique in its capacity and approach to describing food systems. With the right level of insights, stakeholders are empowered to build a narrative from a complex set of indicators, understand the forces at play throughout their food systems, and uncover insights often hidden in the numbers. Through the FSD and other tools, AGRA can increase country and partner access to vetted food systems data—and help streamline any existing efforts, translating a mountain of information into clear steps for action. (Marshall et al. 2021)

The "diagnose" tool of the FSD is the first attempt to identify evidence-based cutoffs (signaling likely, potential, and unlikely challenge areas) across a wide suite of food systems indicators, and apply these performance metrics across all countries. This innovation offers a manageable, expert-vetted scope of progress tracking across the food supply chain and food environment, as

well as a clear view on outcomes—both in terms of population health and nutrition, and the environmental sustainability of national food systems.

Finally, the “decide” function of the dashboard informs decision-making through the provision of country-relevant “no regrets” policy actions. With a clear theory of change, each policy lists clear actions and clear impacts for decision-makers to consider. The recommended policies that this tool generates can offer meaningful, evidence-based stepping stones for governments who are looking for entry points for food systems transformation.

In a recent review of 13 food and nutrition systems dashboards, researchers from Tufts University and Nestlé used 48 evaluation metrics—covering evidence, efficiency, emphasis, and ethics—to assess the completeness and utility of the different data portals. The FSD was rated the top performing dashboard–attaining the best average score among other publicly-available platforms that track and visualize nutrition and food systems data. (Zhou et al. 2022)

With its describe, diagnose, and decide features—the FSD offers evolution potential for CAADP and the *Continental Nutrition Accountability Scorecard* by looking upstream at agricultural supply chains, and reporting useful insights on the food environments that individuals interact with. With effective resource management being a growing concern for many countries, the environmental indicators in the diagnose tool can help build a well-rounded picture of food systems realities across the continent. By providing transparent, validated targets for new indicators in new domains—it can help ongoing accountability and monitoring efforts in Africa to capture the complexity of their diverse food systems, and allow leaders to have a full view when considering the entry points for change.

Impact Potential of the FSD

Investing in agriculture is an important step for food systems transformation in Africa, and one that AGRA has put at the front and center of its mission. Institutional decision making, for AGRA and its partners, can reach new heights through better use of data and tailor-made monitoring systems. Both CAADP and the AU have taken significant strides in this direction. By fine-tuning these reporting mechanisms with additional indicators—ones that are relevant to African countries, vetted by food systems experts and easy-to-interpret for governments—the tracking of progress can lean into the complexity of food systems, instead of being overwhelmed by their interconnections and feedback loops. Food systems offer real, concrete opportunities to develop strong livelihoods, fuel healthy populations, and create sustainable environments—but they cannot deliver without rigorous monitoring and strong commitment from African leaders.

Existing monitoring systems can choose to use, selectively incorporate, or repurpose tools like “diagnose” to better suit their needs and context. Innovations like these offer governments and institutions different ways to capture the true shape of the problem and optimize their approach to interventions. Aligned with the approach taken by the AU’s scorecard, the “diagnose” tool seeks to translate a collection of data visualizations into a summary scorecard of actionable insights. With transparency on performance cut-offs and easy-to-access data sources, this can provide a shortcut for countries to identify problem areas in their food systems and reach for evidence-based solutions.

The traffic light system offers a recognizable scheme for governments and multinational institutions like AGRA to understand the situation at hand, and track progress in coming years. FSD tools are complementary to the ongoing work of the CAADP and AU, and offer a selection of indicators and performance measures that can be used to further build out and fortify the

Nutrition Scorecard. Similarly, the CAADP has a great deal of monitoring lessons to share with the FSD and other initiatives—with the thematic framing of its country and regional scorecards in the BR, and its "naming and faming" of governments that are taking bold steps towards positive food systems transformation.

Through its farmer-centric approach, AGRA and its partners stand to benefit greatly from the joint forces of the CAADP's commitment to rigorous monitoring and the FSD's technical capacity to translate a broad sweep of data into actionable opportunities.

1.3 Findings

The process of applying the new diagnose tool to African food systems is initiated and explored through this report—but one whose full execution requires the expertise, context-specific knowledge, and political will of AGRF partners. Only through careful consideration of the patterns and anomalies can these new datasets be leveraged and transformed into roadmaps for action. While the FSD team has curated a subset of 39 indicators to help pinpoint the challenges faced by national food systems, the selection should serve as a starting point to discuss which metrics can serve the African context best, and help support the monitoring work underway at the CAADP.

The FSD diagnose tool reports country performance on 39 indicators which are nested under four domains: (1) Food Supply Chains, (2) Food Environment, (3) Nutrition Outcomes, and (4) Environmental Outcomes. These domains help capture two sides of food systems realities: the sectors that drive and influence food systems, and the manner that food systems affect the health of populations and the environments in every country.

(1) **Food Supply Chains:** indicators in this domain describe the production patterns (losses across food groups) and production possibilities (via measures of crop diversity)—detailing the upstream realities of country food systems, and highlighting potential inefficiencies at the start of the value chain.
(2) **Food Environment:** this entails the physical and economic circumstances faced by consumers, with indicators that help describe the market supply of different food groups—as well as their relative cost—for each country. This domain also features the cost and affordability of different levels of diet quality, which can help underscore the difference between availability and financial access.
(3) **Nutrition Outcomes:** the indicators here help to underscore challenges in food security, as well as impacts on population health. Two sides of the malnutrition spectrum are monitored—from hunger, anemia, stunting, and wasting, to the prevalence of overweight, obesity, raised blood pressure, and diabetes. Indicators are chosen with care to show the range of dietary outcomes for children, women of reproductive age, and adults.
(4) **Environmental Outcomes:** this domain helps illustrate the way that food systems are impacted by the environment (i.e. soil quality, natural vegetation) as well as the impacts that food systems may have on country ecosystems (i.e. water consumption, fertilizer runoff, impacts on biodiversity) and more generally (i.e. greenhouse gas emissions from food production).

Through these four domains, the FSD diagnose tool can offer meaningful insights for countries. Country findings can also be grouped by income level to bring to light patterns and positive

deviants, or viewed at a regional scale—which can help capture agro-ecological trends that transcend borders, as well as the impacts of trade or other geographic insights.

Overview by Income Level

The FSD recognizes that grouping countries in different ways can tease out important patterns. What may be missed by considering geographic regions could be captured through a nuanced view of country income level, or region. Within these criteria, global patterns can offer useful benchmarks to identify outliers and promising over-performers. (Marshall et al. 2021)

For many indicators, trends emerge in each food systems domain when looking at income level. Globally, populations in low-income countries are confronted with challenges of undernutrition and food insecurity, while high-income countries have a higher prevalence of adult obesity. (Popkin 2021) Middle-income countries are more likely to face a higher double-burden of malnutrition, where undernourishment and risk of non-communicable diseases (NCDs) coexist. (Popkin et al. 2020)

Hunger, especially in children, tends to be more prevalent across low-income countries—where healthy diets are less affordable for the everyday consumer. (Herforth et al. 2022) These countries also face low dietary diversity among infants and young children—amounting to low consumption of key food groups, including fruits, vegetables, and animal-source foods. People in high-income countries face a different food environment—one where sales of ultra-processed foods tend to be more common—and are likely to grapple with higher presence of overweight and obesity in their populations. (Herforth et al. 2022) The divide is less clear with other NCDs: adult raised blood pressure (hypertension) is more prevalent in low- and middle-income countries, while diabetes is most prevalent in upper-middle-income countries. (Herforth et al. 2022) Environmental outcomes such as agricultural land change and threats to soil quality are present across the spectrum of income level, but the food systems in high-income countries are likely to emit more greenhouse gas emissions and experience eutrophication from fertilizer runoff and other industrial activities. (Herforth et al. 2022)

Global observations like these offer a starting point to study correlations between indicators and income status in African countries—many of which mirror the aforementioned trends. (see **Figure 7**) However, many countries present outliers for further study. Among dietary outcomes, the prevalence of wasting in children is an unlikely challenge area for several East African countries in the low-income income bracket, including Rwanda, Uganda, Mozambique, Tanzania, and Malawi. One-off anomalies may hold valuable lessons for others; affordable healthy diets are likely to be out of reach in most low- and lower-middle-income countries, but Egypt does not face the same challenge. In terms of food systems sustainability, the supply chains in Liberia and Mozambique seem to have lower environmental footprints than that of other low-income countries. (Herforth et al. 2022)

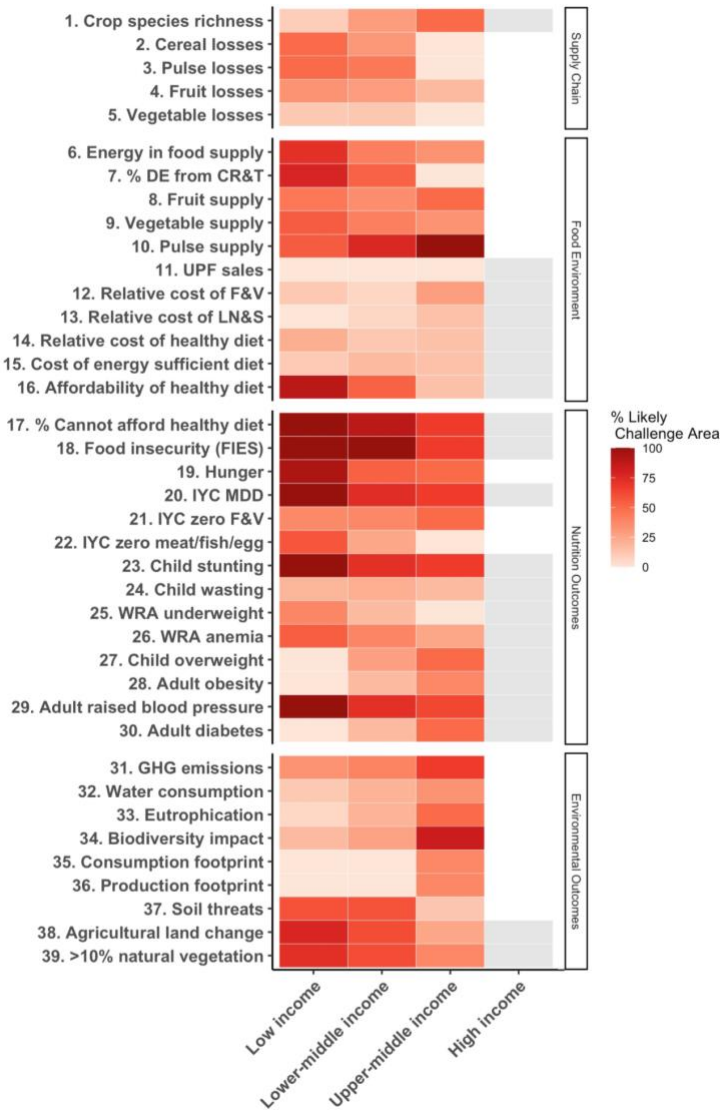


Figure 7. Percentage of African countries with likely challenge areas, by income status. The color indicates the percentage of countries facing likely challenge areas. Grey indicates <2 countries within an income group have data for the indicator.

Areas of risk or opportunity identified through these criteria and others are to be treated as starting points for further exploration at national and sub-national levels. Moreover, it is important to note that any criterion may conceal meaningful heterogeneity in food systems data. (Marshall et al. 2021) Where possible, looking *within* countries, instead of merely *across* them, is the next step to understanding the complex challenges a nation may face in its food system.

Overview by Region

The ease of comparison across countries allows the diagnose tool to be used in a variety of ways—be it continental overview or regional focus, the indicators can tell a meaningful story about food systems. While certain domains can be managed at country-level, food systems often transcend borders—be it through agro-ecological zones, the micro-climates across a given area, or the complex web of trade relationships with countries near and far.

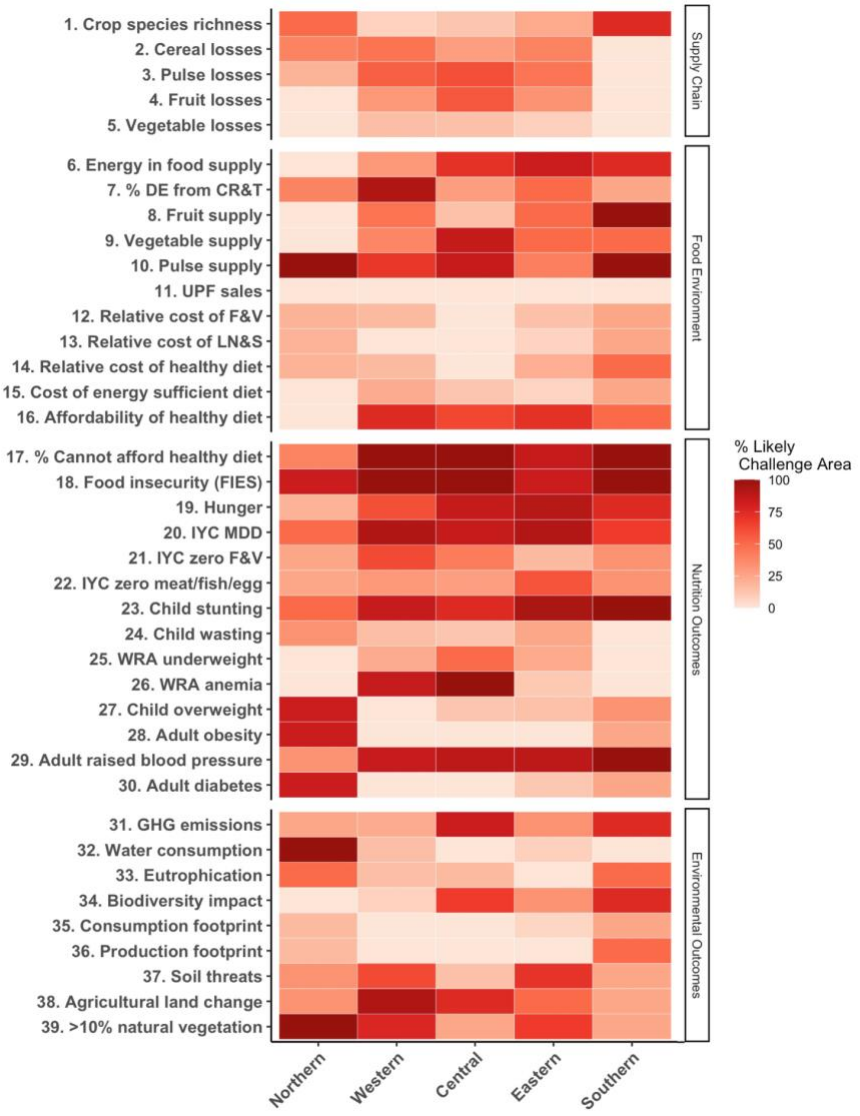


Figure 8. Percentage of African countries with likely challenge areas, by region. The color indicates the percentage of countries facing likely challenge areas.

Each country has a unique food systems reality, and sub-national granularity offers meaningful insights, but much can be gleaned from zooming out to inspect patterns across regions. (see **Figure 8**) For example, regional comparison shows Central Africa to have more likely or potential challenge areas for infant and young child nutrition, as well as for women of reproductive age. Countries in Northern Africa have high prevalence of NCDs in their populations, which could be due in part to a low quantity of pulses in the food supply. Southern and Central African food systems appear to generate high greenhouse gas emissions, and place significant pressure on biodiversity. Eastern Africa sees relatively good performance for adult diabetes and child wasting, but signs of a double burden of malnutrition surface in other indicators. There seems to be considerable crop species richness (diversity) in Western Africa, as well as sufficient energy in the food supply—although affordable, healthy diets appear to be out of reach for most consumers.

The results for the continent can also be divided by Northern, Western, Eastern, Central, and Southern Africa in a more granular way (see **Figure 9**)—demonstrating that aforementioned regional patterns are challenged by several glaring exceptions. This type of visualization invites a deeper dive into national food systems and encourages an eye for positive anomalies that may hold lessons for other countries.

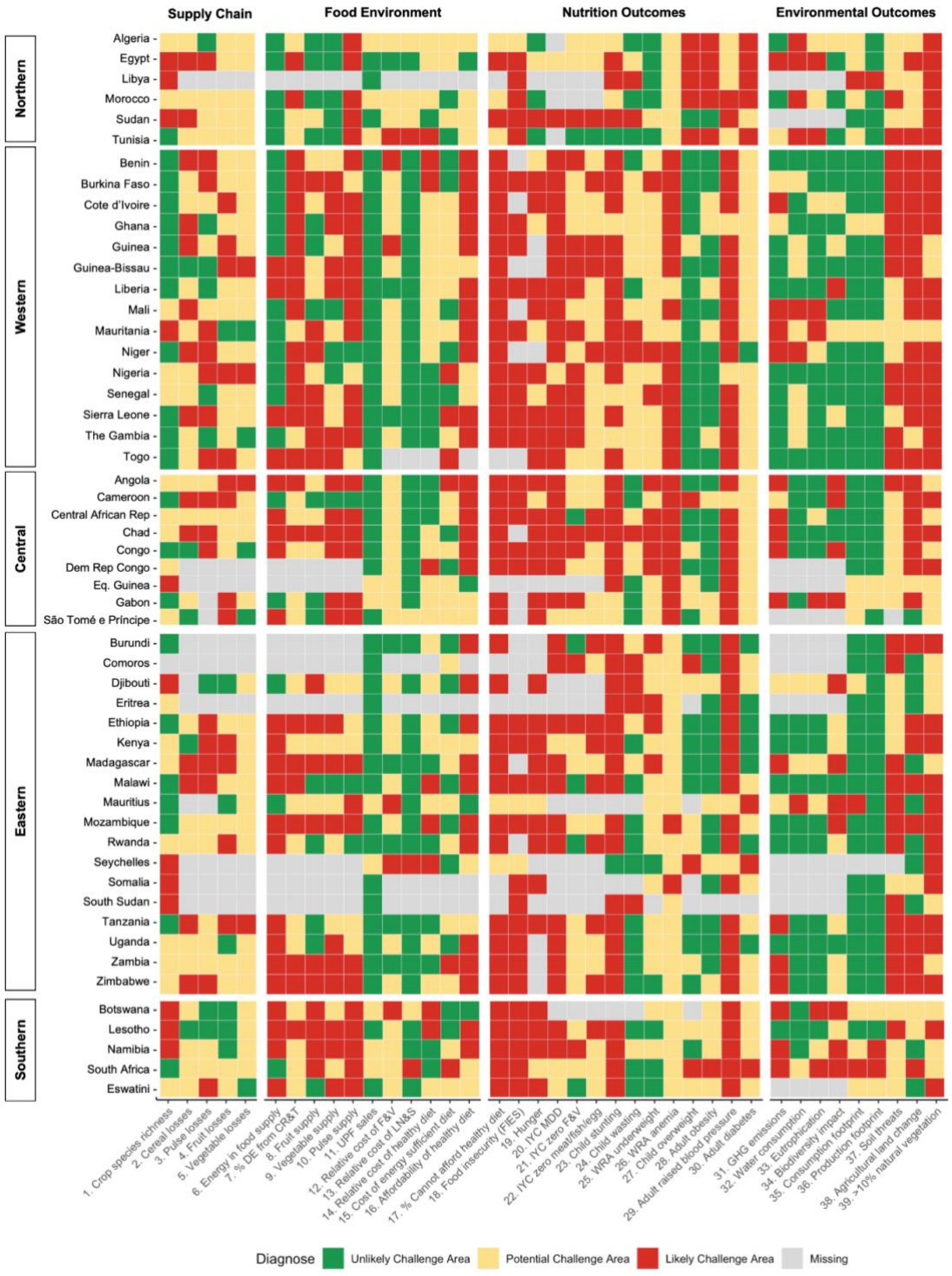


Figure 9. Food systems performance of African countries, grouped by region.

There is a lot of red in the African continent, but food systems are a challenge the world over. Here is a similar figure for Europe, and we can see that although there is more green in the supply chain domain, there is much more red in the environmental outcome domain and more grey in the nutrition outcome domain. (see **Figure 10**) Each continent has its own challenges.

Figure 10. Food systems performance of European countries.

Next, visualizations that portray only the *likely challenge areas* across the continent can help highlight concentrations of food system challenges and identify areas for intervention. (see **Figure 11**) A different breakdown shows that despite varied performance on individual indicators, each region faces similar levels of food systems burdens (34-40% of available data showing likely challenge areas)—a result echoed across income-level groups. (see **Figure 12**)

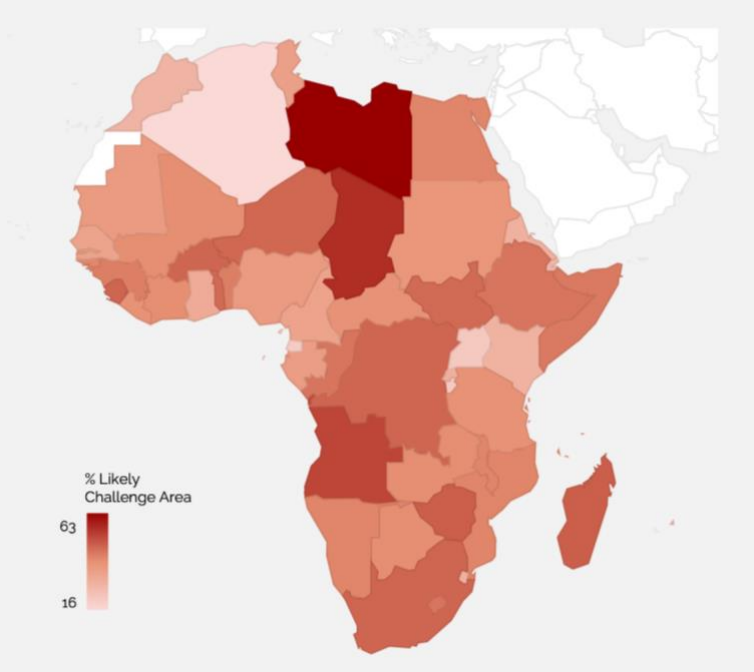


Figure 11. Number of likely challenge areas in each country, as % of available data. No data available for Western Sahara, all other countries see challenge areas in 15-62% of their available indicators.

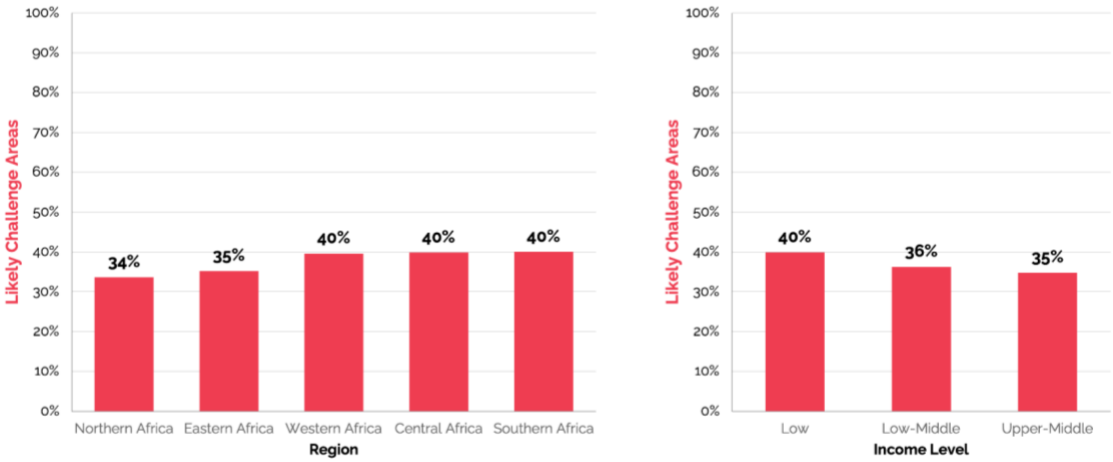


Figure 12. Left: number of likely challenge areas in African countries (by region). Right: number of likely challenge areas in African countries (by income level). All challenge areas reported as % of available indicators.

For many countries, missing data obstructs visibility into food systems performance. Here is another way to view country level results (see **Figure 13**)—where the percentage of unlikely, potential, and likely challenge areas is highlighted by country, as well as the availability of data. Among countries with little or no missing data, the largest ratio of unlikely challenge areas (green) is seen in Angola, Mali, Sierra Leone, Burundi, and Kenya—while food systems in Cameroon and Benin appear to have a considerable presence of likely challenge areas (red) across indicators.

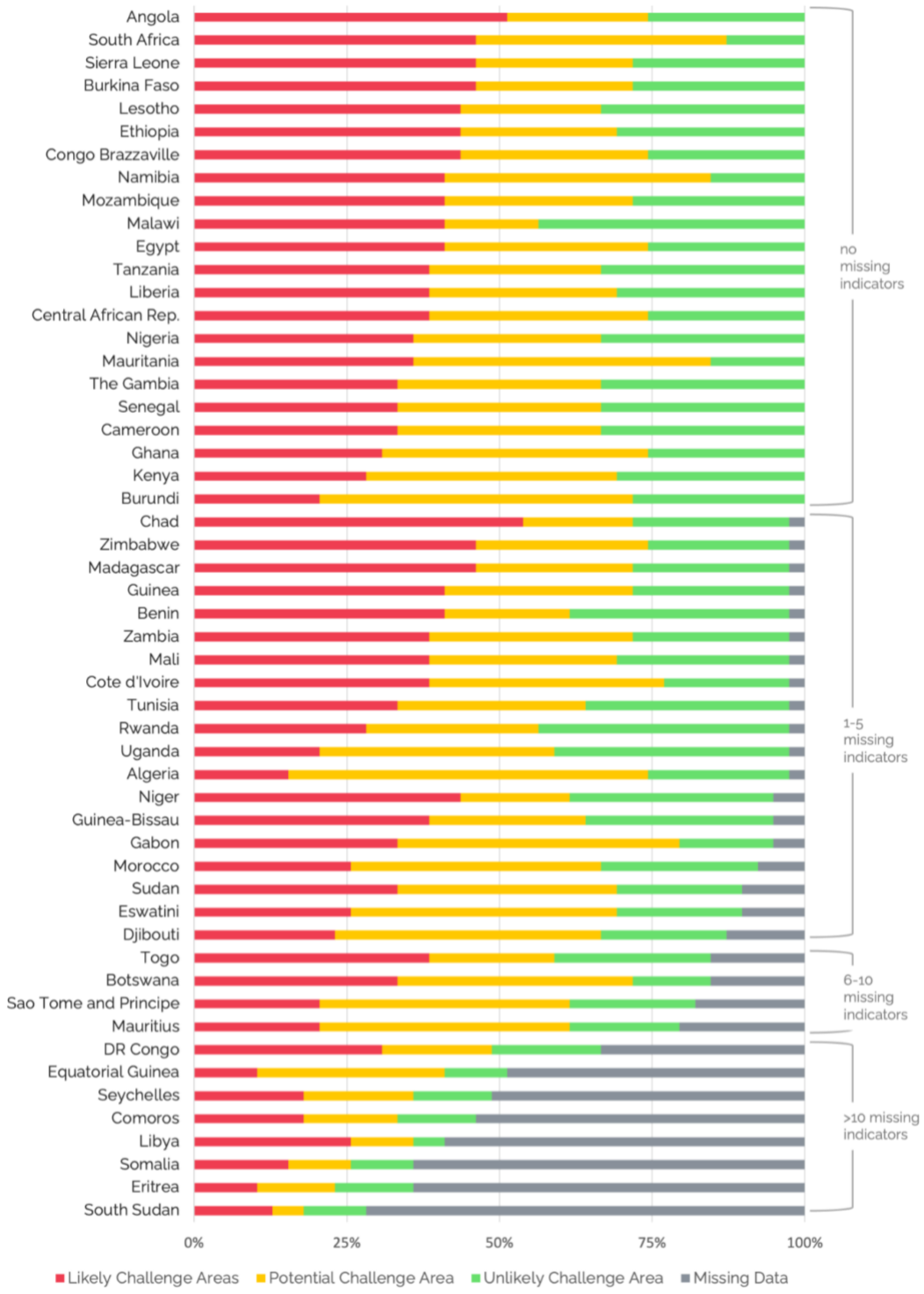


Figure 13. Distribution of unlikely, potential and likely challenge areas for each country. Data availability (out of 39 indicators) noted for countries to the right of figure.

The visualizations above display several ways that “diagnose” results can be analyzed and investigated—together, they present new ways to approach food systems performance, which can offer new and useful lines of inquiry for the African context.

The figures also hint at a complex landscape of positive (or negative) deviants, creating impetus to re-inspect food systems realities *within* regions. The next part of this report will do so, following the four domains of the “diagnose” tool to understand each region’s supply chains and food environments, as well as the nutrition outcomes and environmental outcomes that these food systems create.

Overview by Region: **Northern Africa**

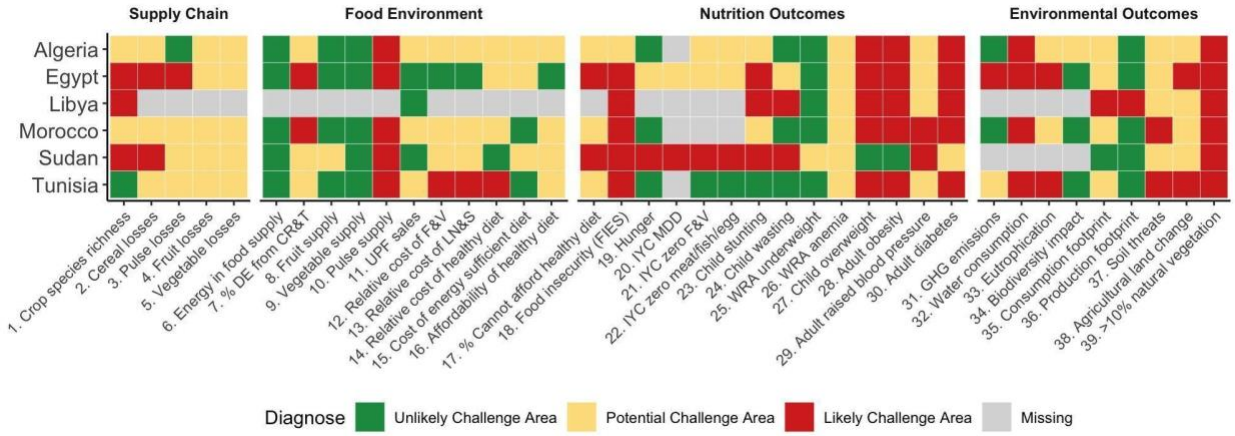


Figure 14. Food systems performance of countries in Northern Africa.

Across Northern African countries, the **Food Supply Chain** (see **Figure 14**)—which includes production systems, input supply, food storage, and distribution logistics—has several potential or likely challenge areas. Exceptions include Tunisia’s high crop species richness score (average number of crops per unit of land), and Algeria’s low pulse losses.

Indicators for the **Food Environment** show good food systems performance for several areas, like sufficient dietary energy in Northern Africa’s food supply, and abundant supply of fruits and vegetables. However, pulse supply across the region is a likely challenge area, and the *cost* of many healthy foods (such as fruits, vegetables, pulses, nuts, and seeds) relative to that of starchy staples (cereals, roots, and tubers) is a potential challenge area for many countries—with consumers paying the highest premium for these foods in Tunisia. Egypt appears to have the most affordable healthy diets in the region (relative to household food expenditure)—presenting an anomaly that may hold lessons for other countries.

Nutrition Outcomes vary in Northern Africa. While regional prevalence of underweight in women of reproductive age is low, anemia remains a potential challenge area for all countries. Child stunting and child wasting are likely or potential challenge areas in Libya, Sudan, and Egypt. For children and adults alike, overweight and obesity prevalence is a likely challenge area everywhere (except Sudan). The presence of other NCDs is also felt across the region: adult diabetes is a likely challenge area for most countries, and Morocco and Sudan see high prevalence of adult raised blood pressure.

In terms of **Environmental Outcomes**, indicators that merit further exploration in Northern Africa include high water consumption and eutrophication (fertilizer runoff and other industrial activities)—though data from a few countries is missing on this front. However, the ecological footprint of food production and biodiversity impacts appear to be low across the region (except in Libya).

Overview by Region: **Western Africa**

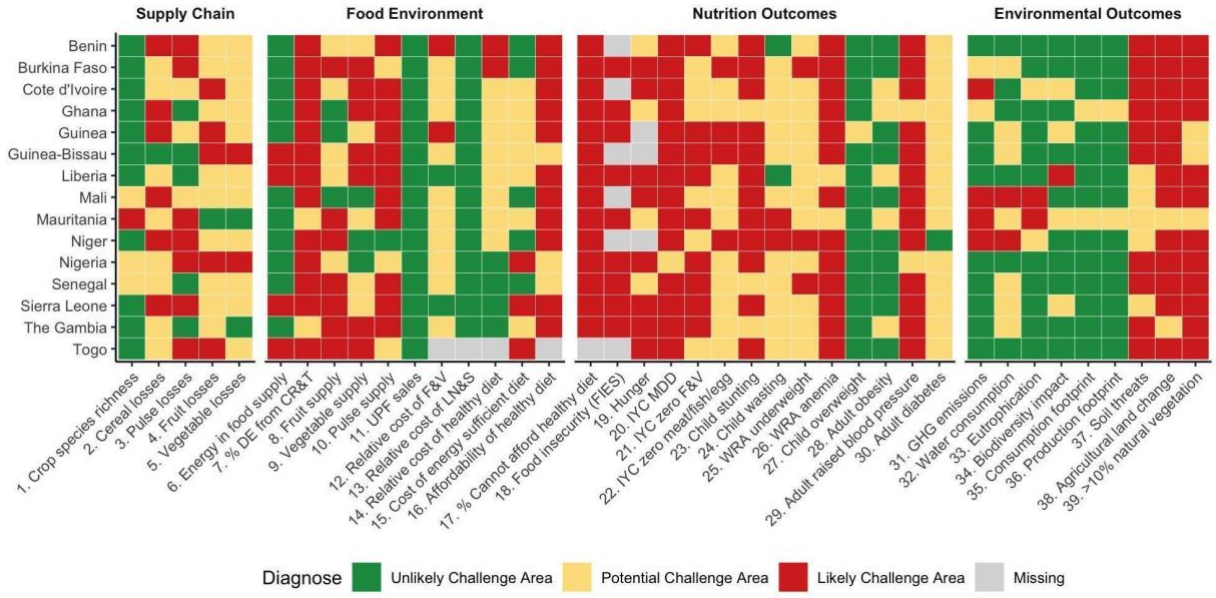


Figure 15. Food systems performance of countries in Western Africa.

In Western Africa (see **Figure 15**), crop species richness stands out as a strong pillar of potential—indicating the capacity for producing a wide range of agricultural commodities across the region's **Food Supply Chain**. However, this pattern is confronted with post-harvest losses in the cultivation of cereals, fruit, and pulses. Exceptions to note include better supply chain retention of cereal crops in Guinea-Bissau, of fruit in Mauritania, and of pulses in several countries (Liberia, Ghana, and neighbors Senegal, The Gambia, and Guinea-Bissau).

The **Food Environment** offers many insights downstream—with certain healthy foods (like pulses, nuts, and seeds) appearing to be relatively affordable across the region, as compared to the cost of starchy staples. Mixed results are seen with fruit and vegetables, which seem to be economically within reach for consumers in Sierra Leone and Liberia, but more expensive in other Western African countries. Overall, the *supply* of several recommended foods—including fruits, vegetables, and pulses—has room for improvement, with a few exceptions in Mali, Guinea, and Ghana that are worth exploring. The relative cost of a healthy diet (versus caloric adequacy) is a likely challenge area in Benin and Burkina Faso, though less so in Nigeria, Sierra Leone, Senegal, and The Gambia. However, the affordability of a healthy diet seems to be a potential or likely challenge area in all countries. With the cost of nutrient-adequacy high in comparison to average household food expenditures, it seems that the cost of food may be generally high relative to people's' incomes. Finally, there appears to be high reliance on starchy staples (cereals, roots, and tubers) in Western African diets, pointing to opportunities for improving diet diversity across this region.

Nutrition Outcomes show that undernourishment is the main driver of malnutrition in this region—all countries in the region with available data face likely challenge areas for affordability and food insecurity, and likely or potential challenge areas for hunger, infant dietary diversity (including low intake of animal-source foods, fruits, and vegetables), child stunting, women (of reproductive age) underweight and anemia. Outliers Benin and Liberia appear to have relatively low prevalence of wasting in children. In terms of NCDs, we see that prevalence of child overweight and adult obesity are unlikely challenge areas for most countries, while raised blood pressure and diabetes in adults are potential or likely challenge areas across the region (Niger is the single exception, with low diabetes prevalence).

Environmental Outcomes in the region are mixed. While most countries appear to have a relatively low consumption and food production footprint, the Sahel faces several challenges. Food systems in Mauritania, Mali, and Niger appear to generate high greenhouse gas emissions—and both water consumption and eutrophication (fertilizer runoff) are likely or potential challenge areas for these countries. The impact of food systems on local biodiversity is relatively low across the region—Liberia's high biodiversity impacts are an anomaly on this front. Threats to soil quality and a high percentage of land being used for agriculture pose additional environmental challenges in Western Africa.

Overview by Region: **Eastern Africa**

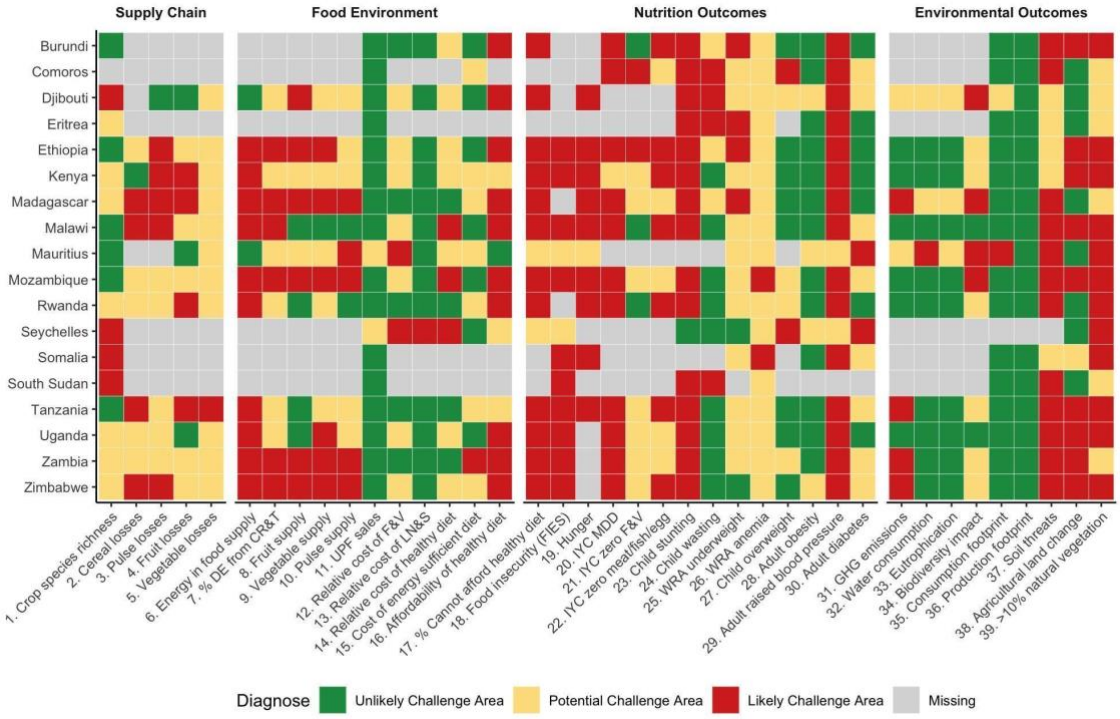


Figure 16. Food systems performance of countries in Eastern Africa.

Across its **Supply Chains**, Eastern Africa (see **Figure 16**) faces likely or potential challenge areas in bringing key commodities to market—with many countries reporting relatively high post-harvest losses of pulses, cereals, fruits, and vegetables. Uganda's supply chains, however, appear to experience better retention of fruit crops—as do Kenya's supply chains when it comes to cereals.

Eastern African countries have several likely or potential challenge areas in the **Food Environment** related to the availability of food—including the supply of fruits and vegetables, pulses, and the overall dietary energy supply. A few countries report higher fruit supply than their neighbors, including Uganda, Rwanda, Malawi, and Tanzania. While the premium that individuals must pay for pulses, nuts, and seeds is relatively low, healthy diets overall appear to be financially out of reach for several countries. It does appear that attaining caloric adequacy (the cost of an energy sufficient diet) is relatively easier for most countries, but this indicator is a likely challenge area for Zambia.

Nutrition Outcomes vary across countries. While child wasting is not a large issue for most countries, indicators for food insecurity, undernourishment, and child stunting show that much of Eastern Africa is grappling with malnutrition. While overall diet diversity is a likely challenge area for infants and young children in much of the region, this demographic consumes more fruits and vegetables in Burundi, Malawi, and Rwanda than in other countries. Anemia is a challenge area for women of reproductive age across the region, most pronounced in Somalia and Mozambique. Child overweight and adult obesity are relatively low in Eastern Africa, but adult raised blood pressure (another NCD) is a likely challenge area for most countries. Results for adult diabetes are mixed, but appear to be most problematic for island nations Mauritius and Seychelles.

Most of Eastern Africa's **Environmental Outcomes** do not stray from continental trends (low consumption and production footprints, low water consumption)—but food systems-related greenhouse gas emissions appear to present a likely challenge area for a few countries (Tanzania, Madagascar, Zambia, and Zimbabwe). The impact on biodiversity is a key concern for food systems in this region—with Malawi and Uganda the only countries with signs of sustainable ecosystem stewardship.

Overview by Region: **Central Africa**

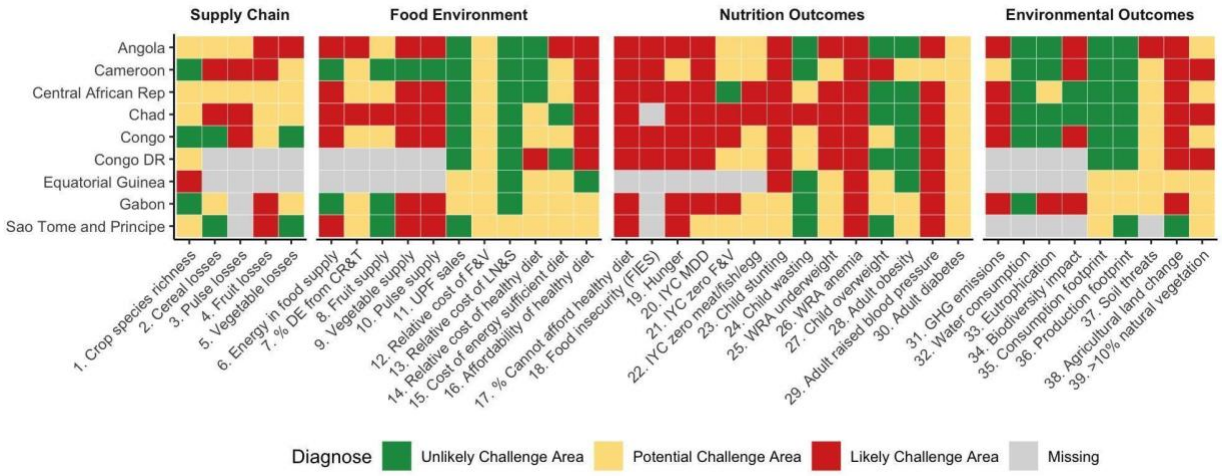


Figure 17. Food systems performance of countries in Central Africa.

In Central Africa (see **Figure 17**), the **Food Supply Chain** has several, contrasting realities. High post-harvest losses of fruit and pulses are seen in several countries, with Cameroon and Chad also facing cereal losses. Congo Brazzaville is an anomaly here, showing unlikely challenge areas for losses in multiple crop categories. Crop species richness scores are high in

Cameroon, Gabon, and Congo Brazzaville—signaling production capacity for diverse agricultural commodities.

The **Food Environment** shows several countries facing low supply for vegetables and pulses, and many with insufficient energy in the overall food supply. Of all food systems in Central Africa, Cameroon appears to perform the best here—with an adequate supply of fruits, vegetables, and high-protein pulses across the board. For many countries, the relative cost of pulses, nuts, and seeds seems to be manageable for consumers (as compared to the cost of starchy staples). Sales of ultra-processed foods are low across the region—only Equatorial Guinea and Gabon experience elevated sales, and therefore a potential challenge area.

In the realm of **Nutrition Outcomes**, Central Africa has several likely or potential challenge areas for infant and young child nutrition, as well as problematic dietary outcomes for women of reproductive age. Though child wasting is an unlikely challenge area for most countries (except Chad), much of the region is experiencing a high prevalence of child stunting. Central African Republic is the only country where infants and young children are consuming adequate fruits and vegetables. It appears that women of reproductive age are likely to be anemic and underweight across the region. Adult raised blood pressure is a likely challenge area for all countries in the region except for Cameroon (potential challenge area). Other NCD risks, however, do not afflict many countries in Central Africa, with the exception of Cameroon's high prevalence of overweight in children.

Environmental Outcomes across Central Africa are marked by GHG emissions from food systems and high rates of agricultural land change. Additionally, many countries experience soil threats as potential challenge areas. Water consumption is an unlikely issue for most countries, and the consumption footprint and production footprint of food systems appear to be low in much of the region. However, there is a region-wide pattern of food systems placing pressure on biodiversity—except for in Chad and Central African Republic.

Overview by Region: **Southern Africa**

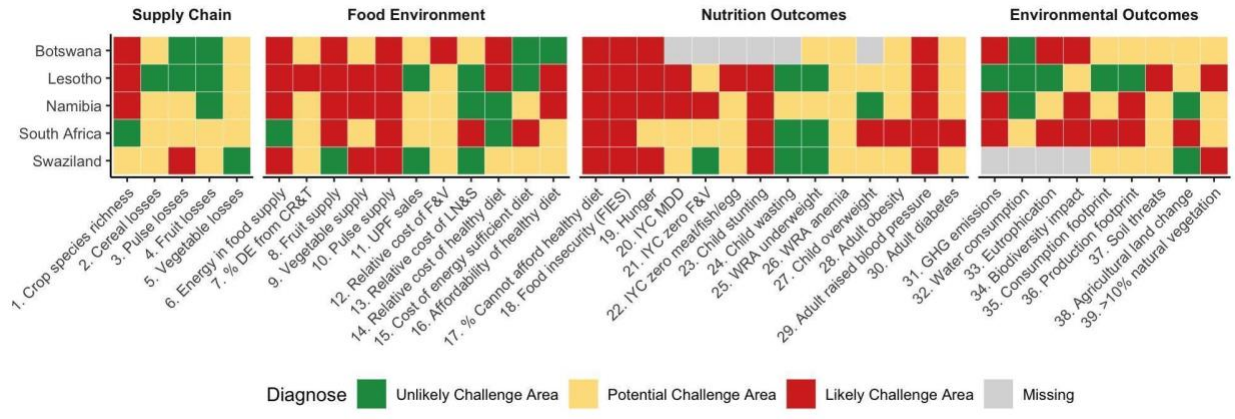


Figure 18. Food systems performance of countries in Southern Africa.

In the **Food Supply Chain**, Southern Africa (see **Figure 18**) has mixed performance. While crop species richness is relatively high in one country (South Africa), this indicator shows a likely challenge area for several countries (namely Namibia and Botswana). While losses of

cereal, pulse, fruit, and vegetable crops are less pronounced, there is room for improvement across regional supply chains.

Data on Southern Africa's **Food Environments** shows that the adequate supply of nutritious fruits, vegetables, and pulses is a likely challenge area everywhere, except for Eswatini's population. Total dietary energy in the food supply is a likely challenge area in all countries except South Africa. The region has elevated sales of ultra-processed food—presenting a potential challenge for countries like Botswana, Namibia, and South Africa. Though the relative cost of pulses, nuts, and seeds (as compared to starchy staples) is low, consistent with many African countries, healthy diets in Southern Africa are generally unaffordable for consumers (though it appears that healthy diets are within reach for populations in Botswana).

The **Nutrition Outcomes** in Southern Africa exhibit challenge areas commonly seen with nutrition transitions. Namely, this region experiences a high prevalence of NCDs—seen across indicators for adult obesity, raised blood pressure, and diabetes—as well as anemia in women of reproductive age. The double-burden of malnutrition is also felt in younger populations, with child stunting a likely challenge for all countries that have data, and the presence of overweight in children (except in Namibia).

Aside from relatively sustainable water consumption, the **Environmental Outcomes** in Southern Africa are more likely to be areas of concern than in other regions. Food systems-related greenhouse gas emissions are relatively high, as well as the impact on local biodiversity. Eutrophication is a likely challenge area in Namibia and South Africa—countries that appear to have relatively higher production footprints than their neighbors.

1.4 Implications

The quick overview in this report is merely a starting point—with insights that may be flagged for further study, or used to confirm the presence of suspected challenge areas. The data presented here have implications for action, for data, and for accountability.

Implications for Action

While an initial review of diagnostic data from the FSD can offer high-level insights on the challenge areas that regions face, it can also be used to track potential and progress across the continent. With clarity on country anomalies amid regional trends, analysts can begin to unpack food systems paradoxes and identify adaptable solutions within reach.

Domains Indicating Potential & Progress

A first round of observations shows crop species richness across West Africa—a trend that can be studied further to understand the diversity of on-farm production in these countries, and used to identify untapped opportunities to set a wide range of nutrition-sensitive agriculture into motion. The "diagnose" tool also shows signs of high fruit and vegetable supply across Northern Africa, indicating a possible abundance of nutritious food groups that, with careful planning, can be brought within closer reach of consumers at affordable prices.

Across the continent, sales of ultra-processed foods present an unlikely challenge area in most countries. However, the retail value of ultra-processed food sales is increasing rapidly in African

countries (DRC, Ethiopia, and Eritrea experiencing the highest rates), highlighting the need to limit further increases before it is too late. Additional timeframes and indicators, including those for packaged foods, can be explored through the FSD. With a growing urban and peri-urban population, ongoing nutrition transitions can be course corrected to both provide and create demand for minimally processed nutritious foods while minimizing growth in ultra-processed foods.

Finally, while child wasting and stunting remains a cause for concern and priority area for action for many countries, there are signs of steady progress—with 15 African countries achieving childhood wasting prevalence within the acceptable range of less than 5%, and 7 countries showing children stunting prevalence below 19%. (ALN 2019)

Domains in Need of Further Support

With the diagnose maps in this report, one can spot a few key domains in need of support across African countries. Though the opportunities and challenges of each country are unique, general themes include supply chain losses, diet quality and cost, the double burden of malnutrition, and potential for climate mitigation.

While there may be challenges to fully optimize supply chains, doing so can start with delivering better tools and assistance to small-holder farmers across the continent. New, low-cost technologies for storage and distribution—fueled by political will to reduce post-harvest losses, and combined with training for farmers—can help to improve value chains in many contexts. The investment must continue downstream, with the small and medium enterprises (SMEs) that play a key role across supply, processing, distribution, and storage networks. SMEs carry extensive knowledge and can act as meaningful thought partners in designing or implementing innovations throughout the value chain. Whether at production, processing, or retail levels—losses are increasingly avoidable and can be targeted with a data-driven approach. Together with AGRA, ideas can be piloted and introduced at scale, and feedback mechanisms with focus countries can (and have) enabled a portfolio of tried-and-true solutions that can be adapted to meet a range of contexts.

Next—with rapid urbanization and economic growth in many African countries, there is a real opportunity to secure healthy diets that are safe, affordable, and desirable for consumers, and to do so at scale across the continent. Urban and peri-urban spaces are important entry points for change, with urban-dwellers already comprising 60% of the consumer base in Africa's food economy. (EAT African Cities Brief 2022) Though diet quality and diet diversity are lacking in many countries, the opportunities to intervene are vast—but with the price of caloric needs approaching (and in some countries, exceeding) current food expenditures, solutions will require both commitment and creativity. Through a closer look at the data, value chain inefficiencies can be uncovered and offer new avenues for getting nutritious foods in the hands of more consumers. Reliance on better information can also enable new partnerships between public and private actors to create demand for nutritious foods, and set up incentives for businesses to produce them.

The growing double burden of malnutrition in several contexts means that undernutrition and diet-related NCDs often coexist within countries, households, and even individuals—signaling a complex reality where further data disaggregation could expose where each country's citizens lie across this spectrum. From the "diagnose" overview of regions, we can see high adult raised blood pressure across the continent, while the prevalence of diabetes seems to track with income level. Anemia for women of reproductive age is common, too, especially in West and

Central Africa, and no region is immune to high prevalence of child stunting, even if child wasting is showing signs of progress.

Finally, food production and consumption apply pressure on environmental systems and with climate change, African countries may have less farmable land in the coming decades—requiring resource management and ingenuity in using existing land productively, but with a more regenerative approach. With the right information, African nations can leapfrog the problems other countries now face, and achieve healthy food futures alongside continental environmental stewardship. Building ecological resilience will also require investment in livelihoods—with nearly 60% of the African workforce relying on agriculture in one way or another, many smallholder farmers and SMEs will bear the brunt of large-scale environmental change in the coming years. Food systems diversification can secure and sustain jobs across the food value chain, with the potential to mitigate climate change effects. Through agricultural price incentives, producer subsidies, and other means, governments can sustain the production of healthy, affordable foods in their countries.

Implications for Data

With greater visibility on data availability, the FSD can help identify research gaps and build a case for further data collection in certain regions, countries, or other areas. A commitment to the use of high-quality data by decision-makers will in turn generate demand for relevant, useful, and updated information—helping monitoring systems keep a pulse on the latest data and using them to guide policy-making.

A key gap in Africa as in most regions is the limited visibility into individual factors and consumer behavior (a black box for many countries), which often lives behind the paywall of different companies. Additionally, the lack of subnational data for many indicators makes targeted programming and planning difficult in countries that face considerable diversity from state to state. And finally, the gap in real-time data makes it difficult to decipher important changes from month to month (or even week to week)—often forcing guesswork with annual averages.

Implications for Accountability

Strong accountability mechanisms can link commitments to actions to impact. Accountability for food systems is critical on many fronts and at different scales, requiring a systems approach that keeps tabs on multiple sectors and is tied to measurable objectives. To measure, one must monitor - and better monitoring is increasingly possible with resources like the FSD. Access to granular, country-level data alongside comparable, regional insights has the power to foster advocacy and bolster accountability mechanisms for complex food systems whose drivers and outcomes often spill across borders and require an integrated, harmonized strategy.

Strong accountability can also reinforce the engagement of other actors in the food system—like NGOs and civil society—and encourage them to continue their independent reporting, use data to hold partners accountable, and ensure that key topics (like the need for healthy food environments) receive the attention they deserve.

PART 2

Part 1 of this report used the most comprehensive global food systems resource, the FSD, to illustrate the kinds of indicator domains, indicators, performance benchmarks, and analyses that the CAADP initiative could consider in its journey to incorporate and align food system targets and indicators into the BR.

Part 2 focuses on the CAADP initiative to expand the set of indicators and targets for monitoring, such that the CAADP BR can offer greater coverage of a country's food system while keeping accountability manageable for governments. Mismatches between the BR indicators and priorities expressed in the UNFSS Country Food System Pathways are noted, and opportunities for incorporating new indicators are explored. This section also considers gaps that can be filled with available and upcoming FSD indicators, which hold meaningful insights for African countries and can take advantage of the newly available performance metrics. The analyses below can help guide consensus on which domains to populate with indicators, how many additional indicators are manageable, what data sources are preferred, and finally—how to secure and establish benchmarks for a transparent and accountable monitoring process.

2.1 Driving the Continental Agenda and Supporting Process Towards CAADP Malabo Targets

The CAADP BR process and tools have become a strong rallying and entry point for supporting African Governments and advocating to Governments to make necessary policy reforms and changes towards inclusive agriculture and food systems transformation. Given the importance of this process to the continent, AGRA has continued to work with and support the African Union Commission, Regional Economic Communities (RECs) and National Government to disseminate the outcome of the 3rd BR report, discuss actions towards improving use of the outcomes and recommendations of the report in enhancing evidence-based planning and investment. AGRA has supported regional BR dialogues in three RECs while three others were planned before the end of August 2022 in line with the post-BR roadmap. AGRA is also working closely with civil society and farmers organizations to sensitize and educate parliamentarians on the value of the BR tools in guiding budget discussions and accountability at regional and national level.

Continental reviews of the impact of CAADP shows that there are still challenges in attaining food systems goals. While implementing CAADP and reaching higher stages of implementation have had significant positive impact on government agriculture expenditure, there has generally been slow progress in most African countries in tackling nutrition. (Benin 2018) While the development of the agricultural sector is progressing, levels of chronic malnutrition and undernourishment are not sufficiently decreasing. The results of the 3rd BR report also showed that the performance of Africa in transforming their food systems have declined between the two review periods, which is consistent with the overall deterioration in performance in achieving the Malabo Declaration goals and targets. The *Global Nutrition Report* also echoed this finding in 2020, and notes that not a single country is on course to meet all ten of the 2025 Global Nutrition Targets, with widening nutrition inequalities within countries and across population groups. The FSD analysis in Part 1 of this report provided an even more comprehensive description of the disconnects and opportunities for action. Consequently, a new food systems focus is required to address malnutrition in all its complexity and enhancing agriculture's impact

on nutrition through increased dietary diversity and improvements in nutrient adequacy. (NEPAD 2019)

Through the CAADP agenda, African leaders envisioned a food systems approach to attain agricultural-led economic transformation. In keeping with this vision, AGRA has been working closely with AUC, RECs, and other stakeholders, to support and intensify efforts towards mainstreaming and domestication of food systems indicators and outcomes of the UNFSS into the BR processes, connecting agriculture to food markets, consumers, and diets.

However, the work does not only end with mainstreaming of indicators. Stepping up the advocacy agenda on food systems will be crucial to ensure that important aspects such as health and nutrition are incorporated in country and continental policies to ensure delivery of healthy and affordable diets.

2.2 Supporting the Mainstreaming of Food Systems Indicators in CAADP Biennial Review Process

We have reviewed the existing CAADP BR indicators, using the UNFSS Action Tracks as a guiding framework and mindful of the FSD. AGRA has worked with the Food System Transformative Integrated Policy (FS-TIP) led by IFPRI, Boston Consulting Group (BCG), AGRA, Tony Blair Institute in partnership with IDRC and Rockefeller Foundation and undertook analytics in 2021 to inform the UNFSS Dialogues and initially in three countries of Malawi, Ghana, and Rwanda. The idea was to demonstrate robust analytics that informed integrative leadership and capacity, in the development and implementation of an ambitious policy agenda aimed at achieving sustainable, healthy diets for all their citizens. Various pieces of related analysis helped understand the state of food systems in each of these countries, identify key gaps and drivers, and develop a framework and monitoring mechanisms for measuring progress towards global and regional agendas and commitments, such as the SDGs, 2025 Global Nutrition Targets, African Union Agenda 2063, and the Malabo Declarations and related CAADP. This work developed key supra indicators per UNFSS action track that represent outcomes of food systems transformation, plus key cross-cutting elements such as governance, to enable easy assessment of the country's status and main areas of attention. In total, 22 supra-indicators have been identified, 21 across UNFSS Action Tracks, and one of them cross-cutting (governance). We then reviewed the CAADP indicators considering these indicators, with a view to assess alignment and extent of coverage of food systems indicators within the current reporting framework. The result of this preliminary assessment is shown in **Figure 19** below.

At the time of design of the 22 food systems supra indicators alongside the UNFSS Action tracks, the detailed FSD indicators were not yet exposed to many, and with the details out as illustrated in part 1 of these reports, there is huge opportunity for CAADP BR process to learn how these can be tracked further to expand and the CAADP food systems coverage of what is being tracked. The FSD analysis is synergistic and can help to expand learnings for the CAADP BR.

Figure 19. Evaluation of some food systems indicators and their coverage in the CAADP Biennial Review.

FSS Action Track	Indicators	Description	Indicator Coverage: CAADP Biennial Review
1. Ensure access to safe and nutritious food for all	1.1 Diet quality	**Food Consumption Score** (FCS). (Aggregated household-level data on diversity and frequency of food groups, weighting according to the relative nutritional value) (%)	Already captured in CAADP (3.5v & 3.5vi, dietary diversity)
	1.2 Nutrient supply	Net supply in country of key macro- and micro-nutrients as a share of total consumption requirements for a healthy diet (unit TBD)	Already captured in CAADP (**3.5v** & **3.5vi,** dietary diversity)
	1.3 Undernourishment	Percent of population undernourished (%)	Already captured in CAADP (3.5iv & 3.5vii, undernourished, food insecure)
	1.4 Overweight and obesity	Percent of population overweight or obese (%)	Candidate for inclusion in CAADP
	1.5 Food safety	Food Systems Safety Index (0-100)	Already covered in CAADP (3.6i, 3.6ii & 3.6iii)
2. Shift to sustainable consumption patterns	2.1 Affordability	Cost of a healthy diet as a percent of household food expenditure (%)	Candidate for inclusion in CAADP
	2.2 Sustainability of diets	Per capita greenhouse gas emissions of food consumption (Kg CO2eq/capita)	Candidate for inclusion in CAADP
	2.3 Food waste	Food Waste Index (kg/capita/year)	Already in CAADP (**3.3**, post-harvest losses)
	2.4 Food environment	Composite Index combining food environment policies (under development) (0-14)	Need to interrogate this further
3. Boost nature-positive solutions	3.1 Emissions	Greenhouse gas emissions from agriculture (MtCO2e)	No explicit measurement of emissions in CAADP
	3.2 Land	Percent deforestation for agricultural land (%)	Already captured in CAADP (**6.1ii,** land under sustainable practices)
	3.3 Food loss	Percent food loss across supply chain (%)	Already captured in CAADP (**3.3,** reduction of post-harvest losses)
	3.4 Regeneration	Biodiversity Habitat Index (%)	Already captured in CAADP (**6.1ii,** land under sustainable practices)
4. Advance equitable livelihoods	4.1 Income	Gini coefficient (specific) based on incomes across the food system (0-1)	Already some indicators captured in CAADP (**4.1i, 4.1ii, 4.1iii** & **4.1iv,** reduction rate of poverty headcount, ag

FSS Action Track	Indicators	Description	Indicator Coverage: CAADP Biennial Review
			contribution to poverty reduction)
	4.2 Income	Gap between farm gate price and retail price (unit TBD)	Already covered in CAADP (**4.1v,** Reduction rate of the gap between the wholesale price and farmgate price)
	4.3 Gender equity	Women's Empowerment in Agriculture Index (0-100)	Already covered in CAADP (**4.4,** Proportion of rural women that are empowered in agriculture)
5. Build resilience to vulnerabilities, shocks and stress	5.1 Economic	Household Resilience Capacity Index (unit TBD)	Already captured in CAADP (**6.1i -** Percentage of farm, pastoral, and fisher households that are resilient to climate and weather-related shocks
	5.2 Risk distribution	Proportion of men and women engaged in agriculture with access to financial services (%)	Already covered in CAADP (**2.4,** Proportion of men and women engaged in agriculture with access to financial services)
	5.3 Social	Government social security budget as a percent of total requirements to cover vulnerable social groups (%)	Already covered in CAADP (**3.4,** Budget lines (%) on social protection as percentage of the total resource requirements for coverage of the vulnerable social groups)
	5.4 Environmental	Notre Dame Global Adaptation Initiative Country Index	Need to interrogate this further
	5.5 Production diversity	Crop Diversity Index (under development) (%)	CAADP captures something on number of value chains (**4.2,** Number of priority agricultural commodity value chains for which a PPP is established with strong linkage to smallholder agriculture
6. Cross cutting	6.1 Governance	Food Systems Transformation Governance Index (unit TBD)	

Figure 20. Food Systems Indicator Mapping. Overview of indicator topics (under the 5 Food Systems Summit Action Tracks) and their coverage in the CAADP Biennial Review, with potential indicators for inclusion (where FSD data is available for African countries). Capacity to benchmark performance metrics is noted for 39 indicators.

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
1. Ensure access to safe and nutritious food for all	1.1 Diet quality	already included	**3.5v** Growth rate of the proportion of Minimum Dietary Diversity-Women (MDD-W)	
			3.5vi Proportion of infants and young children (6-23mo) who meet Minimum Acceptable Diet (MAD)	
		candidates for inclusion	Minimum Diet Diversity (MDD) for infants and young children (6-23mo)	
			Minimum Meal Frequency (MMF) for infants and young children (6-23mo)	
			Minimum Meal Frequency (MMF) for infants and young children (6-23mo)	
			Prevalence of infants and young children (6-23mo) consuming zero fruits and vegetables (%)	
			Prevalence of infants and young children (6-23mo) consuming no flesh foods (%)	
			+ additional indicators on dietary intake (i.e. food groups, micronutrients)	
	1.2 Nutrient supply	already included	**3.2iii** Growth rate of yields for the 5 national priority commodities, and possibly for the 11 AU agriculture priority commodities	
		candidates for inclusion	Dietary energy in food supply (kcal/capita/d)	
			Dietary energy from cereals, roots and tubers (%)	
			Fruit supply (g/capita/d)	
			Vegetable supply (g/capita/d)	
			Pulses supply (g/capita/d)	
			+ additional indicators on yield (i.e. vegetable, cereal) and food availability (i.e. average protein supply, supply of eggs, fish, meat, milk, per capita food supply variability)	
	1.3 Undernourishment	already included	**3.5iv** Prevalence of undernourished (% of population)	
			3.5vii Reduction in the prevalence (%) of adult individuals (15+) found to be food insecure	
			3.5i Prevalence of stunting (%) in children under 5	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
			3.5iii Prevalence of wasting (%) in children under 5	
			3.5ii Prevalence of underweight (%) in children under 5	
		candidates for inclusion	Prevalence of anemia (%) in women of reproductive age (15-49 years)	
			Prevalence of underweight (%) in women of reproductive age (15-49 years)	
			Prevalence of underweight (%) in adults	
			Food insecurity experience scale (FIES)	
	1.4 Overweight, obesity and NCDs	candidates for inclusion	Prevalence of overweight and obesity (%) in children under 5	
			Adult obesity (%)	
			Adult raised blood pressure (%)	
			Adult diabetes (%)	
			Adult raised cholesterol (%)	
			Prevalence of child and adolescent obesity (%)	
			Countries with double burden of malnutrition according to weight and height data	
			+ additional indicators on child and adolescent overweight and obesity	
	1.5 Food safety	already included	**3.6i** Food Safety Systems Index (FSSI)	
			3.6ii Food Safety Health Index (FSHI)	
			3.6iii Food Safety Trade Index (FSTI)	
		candidates for inclusion	+ upcoming EatSafe indicators (i.e. existence of governmental food safety agency, existence of food safety policy or law, existence of food safety standards, etc.)	
2. Shift to	2.1 Affordability	already included	5.2ii Domestic Food Price Volatility Index	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
sustainable consumption patterns		candidates for inclusion	Cost of an energy sufficient diet	
			Cost of a nutrient adequate diet	
			Cost of a healthy diet (relative to the cost of caloric adequacy)	
			People who cannot afford a healthy diet (%)	
			Relative cost of adequate fruits and vegetables	
			Relative cost of adequate legumes, nuts, and seeds	
			Affordability of a healthy diet (ratio of cost of a healthy diet to observed per capita food expenditures from national accounts)	
			+ additional indicators on cost (i.e. of each food group, food groups relative to starchy staples) and affordability (i.e. of each level of diet quality, relative to poverty line, etc.), and relative caloric price (i.e. of eggs, fish, pulses, etc)	
	2.2 Sustainability of diets	candidates for inclusion	Per capita GHG emissions of food consumption	
			Per capita water use linked to food consumption	
			Per capita eutrophication of food consumption	
			Per capita biodiversity impact of food consumption	
			Total ecological footprint of consumption	
	2.3 Food waste	already included	**3.3** Reduction rate of post-harvest losses for (at least) 5 national priority commodities, and possibly for the 11 AU agriculture priority commodities	
		candidates for inclusion	Losses of cereal crops	
			Losses of pulse crops	
			Losses of fruit crops	
			Losses of vegetable crops	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
	2.4 Food environment	candidates for inclusion	Relative cost of adequate fruits and vegetables	
			Relative cost of adequate legumes, nuts, and seeds	
			Retail value of ultra-processed foods sales	
			Retail value of packaged food sales	
			Proportion of wheat flour that is industrially processed	
			+ additional indicators on supermarkets, modern grocery retailers, staple food industrialization, and growth in retail value (i.e. packaged foods, ultra-processed foods, etc)	
3. Boost nature-positive solutions	3.1 Emissions	candidates for inclusion	Total GHG emissions (including OR excluding land-use change and forestry)	
			GHG emissions from agriculture	
			GHG emissions of food consumption (per capita)	
	3.2 Land	already included	**6.1i** Percentage of farm, pastoral, and fisher households that are resilient to climate and weather-related shocks (ṯRAgHh)	
			6.1ii Share of agriculture land under sustainable land management practices (SSLM)	
			6.2 Existence of government budget-lines to respond to spending needs on resilience building initiatives (EIRB)	
			3.1i Fertilizer consumption (kg/ha)	
		candidates for inclusion	>10% natural vegetation	
			Agricultural land as percentage of country land area	
			Agricultural land change during last 10 years	
			Average size of agricultural holding	
			Soil organic content	
			Average threats to soil biodiversity	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
			Average soil biodiversity potential index	
			Average proportion of natural vegetation embedded in agricultural lands	
			Average tree cover in agricultural land	
			Percentage of cultivated land equipped for irrigation	
			+ additional indicators on fertilizer consumption, nutrients (i.e. nitrogen, phosphate) and pesticides per ha of arable land	
	3.3 Food loss	?	?	
	3.4 Regeneration	candidates for inclusion	Average species crop richness	
			Comprehensiveness of conservation of useful wild plants	
			Integrated plant nutrient management	
4. Advance equitable livelihoods	4.1 Income	already included	**4.1i** Growth rate of the agriculture value added, in constant US dollars	
			4.1ii Agriculture contribution to the overall poverty reduction target	
			4.1iii Reduction rate of poverty headcount ratio, at national poverty line (% of population)	
			4.1iv Reduction rate of poverty headcount ratio at international poverty line (% of population), dpovl	
		candidates for inclusion	Share of employment in agriculture	
			Agriculture, forestry, and fishing, value added per worker	
			GINI Index	
			Annual growth in GNI per capita	
			Median income per person per day	
			+ additional indicators on income inequality	
	4.2 Income	already included	**4.1v** Reduction rate of the gap between the wholesale price and farmgate price	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
	4.3 Gender equity	already included	**4.4** Proportion of rural women that are empowered in agriculture	
		candidates for inclusion	Gender inequality index	
5. Build resilience to vulnerabilities, shocks and stress	5.1 Economic	already included	**3.1vi** Proportion of adult agricultural population with ownership or secure land rights over agricultural land	
		candidates for inclusion	Final consumption expenditure per capita	
			Personal remittances received per capita	
			Proportion of population with an account in a financial institution	
	5.2 Risk distribution	already included	**2.4** Proportion of men and women engaged in agriculture with access to financial services	
		candidates for inclusion	Cereal import dependency ratio, 3 year average	
	5.3 Social	already included	**3.4** Budget lines (%) on social protection as percentage of the total resource requirements for coverage of the vulnerable social groups	
			4.3 Percentage of youth that is engaged in new job opportunities in agriculture value chains	
		candidates for inclusion	Percent urban population of total population	
			Lower secondary completion rate	
			Adult literacy rate (15+ years)	
	5.4 Environmental	candidates for inclusion	Global climate risk index	
			Long-term average annual precipitation	
			Total ecological footprint of production	
			Agricultural water withdrawal as percentage of total renewable water resources	
			Percentage of intact area	
			+ additional indicators on fisheries, GHG emissions, pesticide use, etc	
	5.5 Production diversity	already included	**4.2** Number of priority agricultural commodity value chains for which a PPP is established with strong linkage to smallholder agriculture	

Food Systems Summit Action Track	Indicator Topic	Indicator Coverage in CAADP Biennial Review Report		Performance metrics available?
			3.1iii Growth rate of the ratio of supplied quality agriculture inputs (seed, breed, fingerlings) to the total national inputs requirements for the commodity	
		candidates for inclusion	Shannon diversity (food supply)	
			Nutrition functional diversity index (food supply)	
			Biofortified crops released, in testing, in the pipeline	
6. Cross cutting	6.1 Governance	candidates for inclusion	Availability of food-based dietary guidelines	
			Existence of any policies on marketing of junk foods to children	
			National biofortification policies and programs	
			Fortification legislation (i.e. rice, salt, wheat flour, maize flour, oil)	

As evidenced by **Figure 19**, several of the 22 food systems indicators proposed are not currently featured in the CAADP BR. There may also be additional indicators of interest (see **Figure 20**) from the FSD that stakeholders may want to incorporate after reviewing the analyses in part 1. Furthermore, the FSD "diagnose" tool and its methodology may prove useful for establishing performance benchmarks for the proposed 21 food systems indicators.

What is needed now is an inclusive process together with CAADP stakeholders that will generate a manageable set of indicators—which can zero in on the most critical food systems dimensions for African countries, and complement the existing indicators that are monitored through the CAADP BR. Together, AGRA and GAIN hope this collective report can serve as a helpful resource in this endeavor.

CONCLUSION

Robust data is more important than ever in today's interconnected food systems, and innovative approaches are needed to connect the goals of each country to concrete steps for action. Maintaining a systems perspective is key, empowering stakeholders to absorb the full spectrum of economic, social, and environmental drivers and outcomes surrounding food—and to identify the best levers to pull.

Through new and improved indicators, useful food systems narratives can be constructed to promote dialogue and cooperation across food systems actors, encouraging a more nuanced approach to the unique challenges faced by African countries. With the right tools, leaders can more clearly envision the food systems they need, and build the enabling environment that is so needed to bring today's policies in line with tomorrow's goals.

This report has shown the potential for data to provide actionable insights for food system transformation, as long as the data are organized, with benchmarks, and tied to actions. If the CAADP BR wishes to move its monitoring efforts towards a greater food systems perspective, the process can benefit from possibilities described here.

For most countries, sub-national data will be key for providing stakeholders with the level of detail to develop more effective interventions. The FSD team is actively working with countries to procure this data, and is piloting 4 sub-national FSDs in Africa: Kenya, Mozambique, Nigeria, and Ethiopia. This added granularity will complement the current data landscape, and offer governments and institutions like CAADP the needed precision to sustain accountability mechanisms at every level and fine-tune their approaches to food systems change. By highlighting both challenges and priorities for action, the FSD team is committed to offering relevant performance metrics from farm to fork, and helping countries shape their roadmaps with a clear sense of direction.

The 2021 UNFSS demonstrated that today's policymakers, researchers, and business leaders are keen to embrace the interconnected world of agriculture, nutrition, health, and sustainability through a food systems lens. To help governments reshape their food systems, the UN Food Systems Coordination Hub will form a team of global experts and country-level coordinators to conduct a stock-taking every two years, following the 2021 UNFSS. With 2023 around the corner, we look forward to the results of the first stock-take to better understand our collective standing and progress on the path to 2030. Tools such as the BR and the FSD will be essential components of this stock take.

The food systems transformations that leaders on every continent seek is achievable, and AGRA and GAIN are committed to helping CAADP and AGRF communities to take advantage of the tools and data that can best serve the African continent.

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SUPPLEMENTARY MATERIALS

Table 1. Full list of 39 food systems indicators used for FSD "diagnose" tool, showing links to potential contributing indicators where data are available in the FSD.

Diagnostic Indicator	Potential Contributing Indicators
1. Crop species richness	
2. Cereal losses	agricultural infrastructure index
3. Pulse losses	agricultural infrastructure index
4. Fruit losses	agricultural infrastructure index
5. Vegetable losses	agricultural infrastructure index
6. Dietary energy in food supply	cereal import dependency ratio, cereal yield
7. Dietary energy from cereals, roots, and tubers	supply of vegetables, fruit, pulses, milk, meat, fish, and eggs; relative cost of adequate fruits and vegetables; relative cost of adequate legumes, nuts, and seeds, relative caloric prices (RCPs)
8. Fruit supply	fruit losses
9. Vegetable supply	vegetable yield, vegetable losses
10. Pulses supply	pulse losses
11. Retail value of UPFs	existence of any policies on marketing of junk food to children
12. Relative cost of adequate fruits and vegetables	fruit supply; vegetable supply; dietary energy from cereals, roots, and tubers
13. Relative cost of adequate legumes, nuts, and seeds	pulses supply; dietary energy from cereals, roots, and tubers
14. Relative cost of healthy diet to cost of caloric adequacy	relative cost of adequate fruits and vegetables; relative cost of adequate legumes, nuts, and seeds,
15. Cost of an energy sufficient diet	dietary energy in food supply, cereal losses
16. Affordability of a healthy diet (the ratio of the cost of a healthy diet to observed per capita food expenditures from national accounts)	relative cost of adequate fruits and vegetables; relative cost of adequate legumes, nuts, and seeds; RCPs; consumption expenditures
17. People who cannot afford a healthy diet	relative cost of a healthy diet, cost of a healthy diet relative to food expenditures, socioeconomic drivers
18. Prevalence of moderate or severe food insecurity (%) (FIES)	dietary energy in the food supply, socioeconomic drivers
19. Prevalence of undernourishment (%)	dietary energy in the food supply, socioeconomic drivers
20. Prevalence of minimum diet diversity	dietary energy from cereals, roots, and tubers; availability of each food group; relative cost of a healthy diet; affordability of a healthy diet; socioeconomic drivers
21. Prevalence of infants (6–23 months) consuming zero fruits and vegetables (%)	dietary energy from cereals, roots, and tubers; availability of each food group; relative cost of a healthy diet; affordability of a healthy diet; socioeconomic drivers
22. Prevalence of infants (6–23 months) consuming no meat, fish, or eggs (%)	dietary energy from cereals, roots, and tubers; availability of each food group; relative cost of a healthy diet; affordability of a healthy diet; socioeconomic drivers
23. Prevalence of under-5 stunting	infant and young child feeding (IYCF) indicators; relative cost of a healthy diet; affordability of a healthy diet; dietary energy from cereals, roots, and tubers; socioeconomic drivers
24. Prevalence of under-5 wasting	dietary energy in the food supply, IYCF indicators, socioeconomic drivers
25. Prevalence of underweight in women	dietary energy in the food supply, socioeconomic drivers

(Continued)

Diagnostic Indicator	Potential Contributing Indicators
26. Prevalence of anemia in women	supply of vegetables, pulses, and meat; dietary energy from cereals, roots, and tubers; relative cost of a healthy diet; affordability of a healthy diet
27. Prevalence of under-5 overweight and obesity	dietary energy in the food supply, relative cost of healthy diet, affordability of a healthy diet, RCPs, retail share of UPFs, supply of sugar and oil
28. Prevalence of adult obesity	dietary energy in the food supply, relative cost of healthy diet, affordability of a healthy diet, RCPs, retail share of UPFs, supply of sugar and oil
29. Prevalence of adult raised blood pressure	dietary energy in the food supply, relative cost of a healthy diet, affordability of a healthy diet, RCPs, retail value of UPFs, supply of vegetables and fruit, supply of sugar and oil
30. Prevalence of diabetes	dietary energy in the food supply, relative cost of a healthy diet, affordability of a healthy diet, RCPs, retail value of UPFs, taxes on sugar-sweetened beverages (SSBs), supply of vegetables and fruit, supply of sugar and oil
31. GHGe of food consumption	dietary intake indicators, especially red meat and dairy
32. Water use linked to food consumption	dietary intake indicators, especially red meat and dairy
33. Eutrophication of food consumption	fertilizer consumption, nutrient nitrogen per ha of arable land, nutrient phosphate per ha of arable land, dietary intake indicators, especially red meat and dairy
34. Biodiversity impact of food consumption	percent of intact area, agricultural land change
35. Total ecological footprint of consumption (global ha/ capita)	dietary intake indicators, especially red meat and dairy
36. Total ecological footprint of production	crop species richness, agricultural land change, GHGe from agriculture
37. Average number of threats to soil biodiversity	agricultural land as percentage of country land, nutrient nitrogen per ha of arable land, nutrient phosphate per ha of arable land, per capita biodiversity impact of food consumption, per capita eutrophication of food consumption
38. Agricultural land change from 2008–2018	percent of intact area, agricultural land as percentage of country land
39. Average proportion of agricultural lands embedding at least 10% of natural vegetation	agricultural land as percentage of country land, agricultural land change

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Table 2. Detailed information on performance cutoffs, methods, and data sources for 39 "diagnose" indicators.

Sector	Subsector	Indicator	Source	Year	# Countries	Unlikely Challenge Area Cutoffs (N)	Potential Challenge Area Cutoffs (N)	Likely Challenge Area Cutoffs (N)	Cutoff Type*
Food supply chains	Production systems and input supply	1. Crop species richness (average number of crops/ unit of land)	IFPRI 2019 [34]	2010	184	>7 (87)	3–7 (66)	<3 (31)	2
	Storage and distribution	2. Cereal losses (% of domestic supply)	FAOSTAT [35]	2018	156	<2.5 (57)	2.5–7 (77)	>7 (22)	4
		3. Pulse losses (% of domestic supply)	FAOSTAT [35]	2018	150	<2.5 (59)	2.5–5 (64)	>5 (27)	4
		4. Fruit losses (% of domestic supply)	FAOSTAT [35]	2018	166	<5 (49)	5–10 (89)	>10 (28)	4
		5. Vegetable losses (% of domestic supply)	FAOSTAT [35]	2018	167	<5 (35)	5–10 (114)	>10 (18)	3
Food environment	Food availability	6. Dietary energy in the food supply (kcal/capita/d)	FAOSTAT [35]	2018	167	≥2500 (126)	n/a	<2500 (41)	2
		7. Dietary energy supply from cereals, roots, and tubers (%)	FAOSTAT [36]	2016	168	<40 (58)	40–60 (75)	>60 (35)	3
		8. Fruit supply (g/capita/d)	FAOSTAT [35]	2018	168	>200 (85)	100–200 (57)	<100 (26)	2
		9. Vegetable supply (g/capita/d)	FAOSTAT [35]	2018	168	>200 (88)	100–200 (45)	<100 (35)	2
		10. Pulse supply (g/capita/d)	FAOSTAT [35]	2018	168	>60 (5)	30–60 (24)	<30 (139)	2
	Product properties	11. Retail value of UPFs (USD/ capita/year)	Euromonitor [37]	2018	188	<100 (68)	100–300 (60)	>300 (60)	4
	Food affordability	12. Relative cost of adequate fruits and vegetables (ratio of the cost of the recommended amount of fruits and vegetables to the cost of the recommended amount of starchy staples per person per day)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	159	<2 (20)	2–4 (98)	>4 (41)	3
		13. Relative cost of adequate legumes, nuts, and seeds (ratio of the cost of the recommended amount of legumes, nuts, and seeds to the cost of the recommended amount of starchy staples per person per day)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	159	<0.75 (94)	0.75–1 (32)	>1 (33)	2
		14. Relative cost of healthy diet (ratio of the cost of a healthy diet to the cost of caloric adequacy)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	159	<3.5 (38)	3.5–5 (67)	>5 (54)	3
		15. Cost of an energy sufficient diet (2011 USD/capita/d)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	163	<0.75 (74)	0.75–1.20 (75)	>1.20 (14)	2
		16. Affordability of a healthy diet (ratio of the cost of a healthy diet to observed per capita food expenditures from national accounts)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	159	<0.5 (59)	0.5–1 (61)	>1 (38)	2
Food Security, Diets and Nutrition	Food security	17. People who cannot afford a healthy diet (%)	Food Prices for Nutrition [38]	2017 (est for 2018 and 2019)	141	<5 (45)	5–25 (32)	>25 (64)	4
		18. Prevalence of moderate or severe food insecurity (%) (FIES)	FAOSTAT [36]	2019	121	<5 (13)	5-25(52)	>25 (56)	3
		19. Prevalence of undernourishment (%)	FAOSTAT [36]	2019	157	<5 (72)	5–10 (39)	>10 (46)	4

(Continued)

	Dietary intake	20. Prevalence of minimum diet diversity (MDD) in infants age 6–23 months (%)	UNICEF [39]	2013–2018	86	>60 (11)	30–60 (30)	<30 (45)	3
		21. Prevalence of infants (6–23 months) consuming zero fruits and vegetables (%)	UNICEF [39]	2010–2020	97	<25 (32)	25–50 (40)	>50 (25)	4
		22. Prevalence of infants (6–23 months) consuming no meat, fish, or eggs (%)	UNICEF [39]	2010–2020	97	<30 (26)	30–60 (48)	>60 (23)	3
	Nutritional status	23. Prevalence of under-5 stunting (HAZ <-2 SD) (%)	UNICEF, WHO, and World Bank [40]	2010–2019	125	<10 (33)	10–20 (27)	>20 (65)	1
		24. Prevalence of under-5 wasting (WHZ < -2 SD) (%)	UNICEF, WHO, and World Bank [40]	2010–2019	124	<5 (69)	5–10 (39)	>10 (16)	1
		25. Prevalence of underweight in women (BMI <18.5 kg/m^2) (%)	NCD-RisC [41]	2016	190	<5 (123)	5–10 (41)	>10 (26)	1
		26. Prevalence of anemia in women 15–49 years (%)	WHO Global Health Observatory [42]	2016	187	<20 (37)	20–40 (115)	>40 (35)	1
		27. Prevalence of under-5 overweight and obesity (WHZ >2 SD) (%)	UNICEF, WHO, and World Bank [40]	2010–2019	116	<5 (53)	5–10 (40)	>10 (23)	1
		28. Prevalence of adult obesity (BMI ≥ 30 kg/m^2) (%)	NCD-RisC [41]	2016	190	<10 (50)	10–22.5 (56)	>22.5 (84)	4
	NCDs	29. Prevalence of adult raised blood pressure (SBP ≥ 140 or DBP ≥ 90 mm Hg) (%)	NCD-RisC [43]	2015	189	<20 (36)	20–25 (68)	>25 (85)	3
		30. Prevalence of diabetes (%)	NCD-RisC [44]	2014	190	<6 (27)	6–10 (97)	>10 (66)	3
Environment Outcomes	Environment measures at consumption level	31. GHGe of food consumption (kg CO_2-equivalent / capita)	WWF [45]	2010	147	<2000 (61)	2000–2500 (28)	>2500 (58)	4
		32. Water use linked to food consumption (liters/capita)	WWF [45]	2010	147	<250 (49)	250–350 (48)	>350 (50)	3
		33. Eutrophication of food consumption (g PO_4-equivalent /capita)	WWF [45]	2010	147	<7500 (48)	7500–10000 (41)	>10000 (58)	3
		34. Biodiversity impact of food consumption (extinctions per species year*10^{12}/capita)	WWF [45]	2010	147	<350 (48)	350–750 (47)	>750 (52)	4
		35. Total ecological footprint of consumption (global ha/ capita)	Global Footprint Network [46]	2016	177	<1.68 (55)	1.68–2.75 (42)	>2.75 (80)	2
	Environment measures at production level	36. Total ecological footprint of production (global hectares/ capita)	Global Footprint Network [46]	2017	177	<1.67 (77)	1.67–2.75 (33)	>2.75 (67)	2
		37. Average number of threats to soil biodiversity	Orgiazzi et al. 2016 [47]	1997–2010	181	<1 (3)	1–2 (101)	>2 (77)	2
		38. Agricultural land change from 2008 to 2018 (log(1,000 ha/ year))	FAOSTAT [48]	2018	193	<0 (52)	0–2 (39)	>2 (102)	2
		39. Average proportion of agricultural lands embedding at least 10% of natural vegetation (%)	Jones et al. 2021 [49]	2015	234	>50 (17)	25–50 (65)	<25 (152)	2

Cutoff type: 1) Published / pre-established cutoffs on prevalence of public health significance, 2) Cutoffs based on normative recommendations, 3) Cutoffs based on global distribution of data: Rounded tertiles based on normal distributions (see Figs 2 and 4) Cutoffs based on global distribution of data: Binning based on bimodal or skewed distributions (see Fig 2).

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