

Global Food System Index

Concept Note

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Overview

A food system that sustainably provides food security and nutrition for all is essential to promote and maintain the well-being of all people and of the planet. Food security, defined by the Food and Agriculture Organization (FAO), exists when “all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (Source: FAO SOFI 2011¹). The four pillars of food security are availability, access, utilization and stability. These, combined with nutrition and sustainability, provide the foundations of a desirable food system. Such a food system will be key to achieve multiple Sustainable Development Goals (SDGs). For these reasons, a Global Food System Index (GFSI) is critical to monitor and track progress toward a desired food system.

By providing decision makers with a broad and practical tracking and monitoring tool, the GFSI would support the World Economic Forum’s Global Agenda Council on Food and Nutrition Security mandate of ensuring sustainable food and nutrition security for all. The GFSI will aim to fill a gap among a crowded field of indexes and indicators; while many indexes exist, none distills the complexities of the entire food system into a single index or set of indexes.

The GFSI will be developed and disseminated to help users prioritize investments in food systems, assess the policy and institutional support for climate smart practices and sustainable systems, and track the development impacts of food systems (among other uses). It will allow users to dynamically work with the various dimensions of the Index to better understand the complexities of food systems. Users of such an index may come from various sectors and spheres, including decision makers in governments, international organizations, the private sector, donor agencies, civil society, and academia.

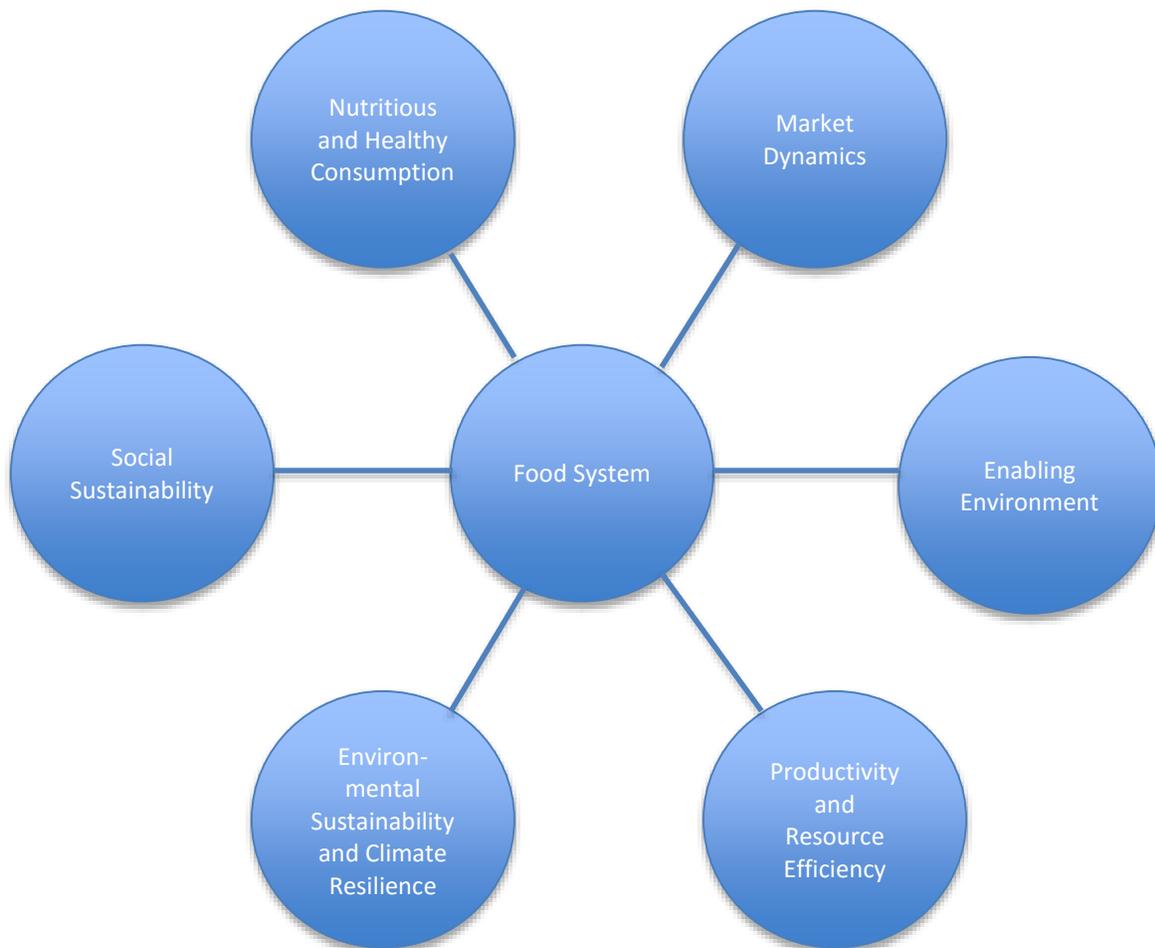
Drawing from the UN Secretary General’s Zero Hunger Challenge, a food system is defined as a system that “embraces all elements (environment, people, inputs, processes, infrastructure, institutions, et cetera) and activities that relate to the production, processing, distribution, preparation, and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes.” Understanding the many moving parts of a food system requires a tool; in this case, an index.

This concept note lays the foundation for the index we aim to develop. Our attempt here is not to challenge or resolve abstract questions on the concept and definitions of food systems, but rather to create an evidence-based tool, useful to practitioners, for understanding the complexities and improving the quality of food systems that affect people's lives.

¹ <http://www.fao.org/docrep/meeting/026/MD776E.pdf>

Proposed dimensions and indicators

An ideal global food system would successfully address challenges to human and ecological well-being across all of its aspects. To track progress toward such a system, the GFSI would cover six key dimensions: Nutritious and healthy consumption, market dynamics, enabling environment, productivity and resource efficiency, environmental sustainability and climate resilience, and social sustainability.



Nutritious and healthy consumption

While tremendous progress has been made in improving global food security, 795 million people, or one in nine people, remain undernourished. Furthermore, progress has been uneven across regions. Latin America, East and South-east Asia, Central Asia and North and West Africa have greatly reduced hunger, with rapid progress in populous countries such as China and Brazil making huge contributions to global hunger reduction. However, such progress masks the high levels of hunger that persist in Africa south of the Sahara, where nearly one in four people are undernourished. Progress has also been slow in the Caribbean, and in West Asia, where the share of hungry people has increased since 1990.

The world also faces serious nutritional challenges. Undernutrition is the single biggest contributor to child mortality, and one of the world’s most serious health and human development challenges. Although the overall trend for undernutrition is improving, there are still 162 million children under-five who are stunted, the vast majority of whom live in Sub-Saharan Africa and South Asia. Worldwide an estimated two billion people suffer micronutrient deficiencies. A confluence of factors that intersect with the global food system can exacerbate malnutrition. For example, lack of adequate water, sanitation, and hygiene (WASH) infrastructure compromises food safety practices in production and consumption of food, resulting in diseases that can cause or worsen undernutrition and micronutrient deficiencies.² Consequences of undernutrition extend beyond individual health outcomes. The impaired cognitive and physical development that results hinders educational attainment, and workforce capacity and productivity, ultimately undermining the economic progress of countries.

On the other end of the spectrum, a growing number of people are suffering from over-nutrition; currently over 2 billion people are overweight or obese. Physical, social, and economic consequences of over-nutrition are experienced in nearly every country in the world. Further, food safety is under threat from rising agriculture-related risks to health and increased threats to the safety of food supplies in countries of all stages of modernization and intensification of industrial and agricultural activities (consider rice contamination in China and aflatoxin in maize in Africa, for example). Concerted efforts are needed to align the global food system to enable and promote increased consumption of safe, nutritious, diverse diets in amounts adequate to meet food-based dietary recommendations while limiting processed foods of limited or no nutrition value.

Indicators to measure the nutritional aspect of the food system include the extent to which diverse foods are consumed, as well as average overall food supply, which can also serve as an indicator for food security. New indicators on dietary diversity and obesity, particularly those that are aligned with the post-2015 development framework, can help understand dietary trends and outcomes, and will be considered as they are rolled out. Indicators on governmental commitments to nutrition plans that aim to address under- and over-nutrition, as well as governments’ investments in nutrition-driven agriculture will also be considered. To measure food safety, an indicator of incidents of agriculture-related disease by country will be considered, as well as the existence of an agency or body to ensure the safety and health of food.

Select candidate indicators for the *Nutritious and Healthy Consumption* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Nutrition	Dietary diversity score	FAO	2011
	Average food supply	FAO	2011
	Nutrition plan or strategy	HANCI	2014
Health	Food safety	IFPRI	
	Agency to ensure the safety and health of food	HANCI	2014

² Topics like 'sanitation,' while important for nutrition, present a field of research in itself. To delineate the GFSI, its model may include an overarching sanitation score, while referring to dedicated external indices (i.e. like the "WASH performance index") for more detail.

Market dynamics

A desirable food system must be supported by well-functioning market and trade dynamics, and linkages in food supply chains that work for all actors in the food system. Good market and trade policies can minimize the negative effects of market shocks and improve resilience across the value chain while limiting negative externalities for foreign countries and agents.

Markets and trade must work for all actors in the food system, especially smallholders, as 500 million smallholder farms in the developing world provide an estimated 80 percent of the food produced in Asia and Africa south of the Sahara. Yet because smallholders are a vulnerable group, and often neglected by development policy, they account for most of the world's poor and hungry. Maximizing the potential of smallholder farms through well-functioning markets can greatly improve food security and improve rural livelihoods.

Ultimately, market dynamics must work for consumers by providing adequate, safe, and nutritious food for all. Increasing physical access to markets, particularly for the poor and vulnerable, will be key in ensuring an inclusive and healthy food system for all. Further, increasing availability of food through open, fair, and transparent trade policies can help improve food security, particularly in countries whose food systems are not as productive or resource efficient. It is also key that the food system provides stability and mitigates the risk of extreme food price volatility, for example through well-regulated food warehousing and reserve systems.

To measure the interconnectedness of a country's food system to global markets, an indicator that captures measures of trade of agricultural products will be included. Indicators examining policies that promote open, fair, and transparent trade will also be considered. Market inclusion for producers, especially smallholders, as well as for consumers will be considered. Access to, or levels of, internal and external value-chain financing, from SME financing to more direct commercial financing of the sector's activities, will be considered as indicators for well-functioning markets. Additionally, an indicator on price volatility, and policies used to reduce it, will be examined with particular consideration for the SDG indicator for food price volatility and the Agricultural Market Information System (AMIS).

Select candidate indicators for the *Market Dynamics* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Open, fair, transparent trade	Agricultural import tariffs	WTO	Annual (2010-13)
Price volatility	FAO Price Indices	FAO	2015
Market inclusion of smallholders	Rural access to credit	World Bank (Agribusiness indicators)	

Enabling environment

It is critical that governments create an environment in which private entities and initiatives—from major international food corporations to small-scale farmers—can invest in the food system and profitably and sustainably supply safe and nutritious food. Private sector

participation, as well as foreign and domestic investments, which help push forward critical advances in technology, productivity, and other outcomes. By supporting all actors in the food supply chain, an enabling environment should incentivize the private sector to contribute to enhancing food security and nutrition in a sustainable and inclusive way³. Besides supply chain linkages between private sector parties, this equally includes partnerships with public bodies, development agencies, and civil society organizations.

To function well for private enterprises, an enabling environment will require, among other things, adequate transportation, communication, and energy infrastructure; legal, regulatory, and institutional frameworks; availability of finance; and agricultural research and extension services. It must also work to support all actors in the value chain, including commercially viable small farm enterprises. In such an environment, private-sector actors in the food system can contribute to goals such as nutrition or sustainability if pursuing those goals also expands their potential for profits. Toward this end, policies that encourage production patterns must be examined.

Indicators examining the enabling environment for engagement and investment along the food value chain, such as government investments in agricultural R&D and extension, will be included. Also, coordination mechanism (existence and functionality) between the different agencies responsible for agriculture, water management, forestry, environment and sustainable development is a useful indicator. Policies that promote enabling environments for a range of actors including smallholders will be considered. Indicators that measure how a country’s rule of law is experienced—and in particular how it impacts market linkages and the enabling entrepreneurial environment—will also be considered.

Select candidate indicators for the *Enabling Environment* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Enabling environment for business	Presence of formal grocery sector	EIU	Annual (2009-15)
	Land tenure security for smallholders	To be Created ⁴	
Investments in agricultural research	Public expenditure on agricultural R&D	ASTI	Occasional (2011)
Policy and coordination	Government investment, coordination mechanism, policy	WB CSA	

³ While the GFSI will include indicators for promoting an enabling entrepreneurial environment at the country level, it will refer to other indices (i.e. Access to Nutrition Index) for company-specific accountability and ranking by companies’ contribution to addressing poor nutrition and dietary patterns.

⁴ There is no global, nationally-representative, sex-disaggregated data on tenure security. However, the Post-2015 SDGs offer a promising opportunity through the inclusion of a cross-cutting land rights indicator. In the short-term, this critical data void can be filled using a global poll until national-level household surveys are implemented. For more information on a path forward supported by a coalition of over 20 civil society organizations see: <http://landpost2015.landesa.org/wp-content/uploads/2015/04/One-Indicator-Many-Targets-A-Path-for-Tracking-Land-Rights-Post-2015.pdf>

Productivity and resource efficiency

A productive food system is one that produces crops, livestock, and fisheries using the fewest resources possible. The global food system must be productive as the current global population will increase to 9 billion by 2050. By then, per capita arable land will decrease by 50%, while food production will need to increase by 60% to meet demand.

Further, the global food system must move beyond the traditional approach of focusing primarily on boosting food production and productivity. As such, a desirable food system must be resource-efficient to meet current and emerging demand for food without jeopardizing the availability of scarce resources. Resource-efficiency is particularly crucial as competition for energy, and water is growing—for example, agriculture’s demand for water could rise by over 30% by 2030 as availability shrinks. All resources must be used more efficiently to meet current and future needs sustainably.

Beyond resource-efficient production, resource-use efficiency must be promoted throughout the food value chain. Mid- and downstream aspects of the value chain must contribute to resource-use efficiency by reducing food losses and waste, as one-third of food produces for human consumption is lost or wasted globally—a figure that points to an inefficient and unsustainable global food system. Reducing food losses and waste can not only contribute to greater resource efficiency, but also to food security via greater availability.

The productive and resource efficient dimension will measure the efficiency of staple crop production in a country. Further, as not all countries have the same yield potential for each crop, an indicator of yield gaps for selected crops will be considered to measure how close each country is to achieving their potential in productivity. Indicators to address resource efficiency will include resource-use efficiency in agriculture with respect to water and energy use. An indicator on food losses and food waste will also be included.

Select candidate indicators for the *Productivity and Resource Efficiency* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Staple crop productivity	Average yields of cereals and pulses	FAO	Annual (2013)
Potential for productivity	Yield gaps	IFPRI	
Resource use efficiency in agriculture ⁵	Water productivity		
	Energy use efficiency		
Food losses and waste	Food loss	FAO	2011
	Food waste	FAO	2011

Environmental sustainability and climate resilience

The global food system must be environmentally sustainable and resilient, especially in the face of climate change, as the global agriculture sector is by far the main contributor of greenhouse gas emissions (GHGs) and to ongoing climate change. At the same time, agriculture is affected by climate change and adverse weather, water and soil conditions. Therefore, an

⁵ Land use efficiency is covered in the "productivity" dimension

environmentally sustainable food system must be climate smart. A climate-smart food system is one that integrates agricultural development and climate responsiveness, and aims to reduce/remove GHGs and build resilience. A climate-smart approach is essential, as significant crop yield impacts are already being felt at current levels of warming. As temperatures rise, climate change will add further pressure on agricultural systems across regions. For example, 2°C warming by 2050 is projected to reduce wheat yields by up to 50 percent in Tunisia, Brazil, and Central America and the Caribbean.

An environmentally sustainable food system must also minimize negative impacts on the environment and promote biodiversity, thus improving agro-ecological resilience. Land degradation is a growing problem, as it reduces resilience, productivity, and the resources available to all species. Currently, 12 million hectares of productive land become barren every year due to desertification and drought, resulting in lost opportunities to produce up to 20 million tons of grain.

The World Bank’s Climate Smart Agriculture (CSA) indicators will form the basis for the food systems index climate smart dimension. They revolve around adoption of CSA technologies and policies, as well as outcome indicators that measure the results of CSA adoption. An indicator on the agriculture sector’s impact on biodiversity and land degradation will also be considered.

Select candidate indicators for the *Environmental Sustainability* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Climate-smart agriculture	Policies and institutions	World Bank	
	Technologies	World Bank	
	Results of CSA adoption	World Bank	
Agro-ecological resilience	Land degradation/NDVI	Global Land Degradation Information System (GLADIS)	

Social Sustainability

A desired food system must be socially sustainable for all actors along the value chain. For producers, the food system must be inclusive, particularly of smallholders, women and youth, as such groups will be critical in meeting emerging demand and providing safe, adequate, and nutritious foods for their households. Yet these groups face constrained access to assets and markets and are at risk of exclusion from increasingly complex food value chains. Supporting commercially viable smallholders and empowering women and youth are not only critical for food security and nutrition, they are also necessary to achieve several other SDGs, particularly those related to reducing inequalities.

Additionally, a food system can only be considered socially sustainable if it delivers adequate food that is physically and economically accessible to all at all times. When and where markets cannot deliver, government intervention should ensure that poor and vulnerable consumers are included in the food system, even in the face of unpredictable circumstances such as price or weather shocks. Social safety nets (e.g. cash transfers, food distribution, seeds and tools distributions, and conditional cash transfers) as well as national policies and strategies can also

boost resilience of food system actors, including consumers, for greater social sustainability. Additionally, food warehousing can help smooth shocks by supporting vulnerable groups in times of need. A socially sustainable food system enhances the resilience of all actors to prevent, prepare for, cope with, and recover from shocks and not only bounce back to the level of efficiency before the shocks occurred, but become even better-off.

Potential indicators for a socially sustainable and inclusive food system include women’s empowerment in relevant domains and intra-household gender parity. To measure inclusion of smallholders, women, and youth, an indicator on land tenure security and access to financial services for these groups will be considered. Considerations of physical and economic access will be made with particular attention to poor and vulnerable groups to measure the social sustainability of consumers.

Select candidate indicators for the *Social Sustainability* dimension

Sub-component	Indicator	Data source	Frequency of data (most recent year)
Women’s empowerment	Women’s empowerment in 5 domains	WEIA	Every 2-3 years (2013)
	Intra-household gender parity	WEIA	Every 2-3 years (2013)
Access to food for vulnerable groups	Share of expenses for food/quality of social safety nets		

Limitations of existing indexes related to the food system

Many indexes and indicators exist that can assess certain aspects of a country’s vulnerability of their food systems and their progress in achieving food security and nutrition. An overview of these and other indexes are found in the table below, which will be supplemented to include a mapping of existing indices against criteria such as validity and transparency of methods and data collection, relevance, frequency and continuity of data collection, and coverage. While these indexes are useful, they have their limitations.

Most importantly, none of the existing indexes give a complete assessment of the strength of countries’ food systems in all dimensions. Existing indexes tend to focus on particular aspects of the food system – e.g. food security, nutrition or sustainability of production methods. While this may be a strength for monitoring certain issues in depth, our goal of establishing a global food system index requires a broad and holistic approach – whilst allowing to zoom in to understand the intricacies of the food system in all necessary detail.

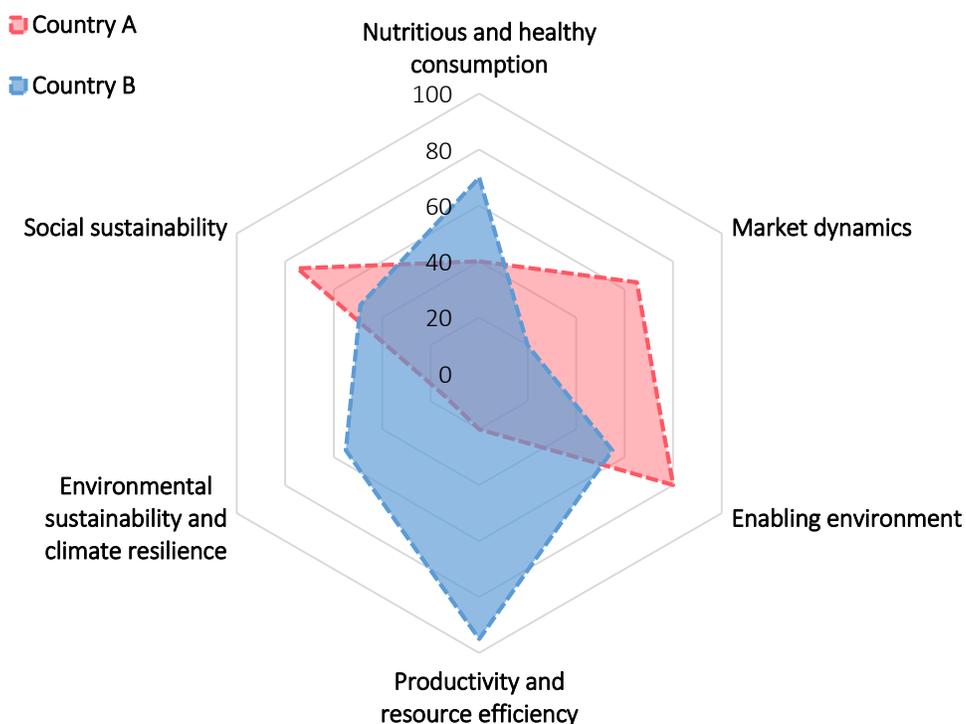
Other problems relate to how indexes are constructed. Upon design, new indexes often simply reorganize existing data. Although their designs and methods may be sound, little is gained if the quality, accuracy, and timeliness of the underlying data are poor. Generating new data or updating data more often could help improve the relevance and utility of all indexes. Distortions can arise if an index integrates several indicators that are driven by the same underlying factors, such as income. For instance, low agricultural prices may strengthen consumers’ food security but harm that of producers who are net-sellers. The GFSI will through its rigor of design eliminate such flaws.

Thirdly, existing indexes in most cases do not allow for dynamic analysis and scenario analysis of food systems. For policy makers, it is essential not only to receive a static representation – often only comprised in one overarching ranking – but also to understand interdependencies and dynamic development of parameters over time. By presenting the index in an innovative way, users can dynamically work with the index to help understand the complexities of the food system in its various dimensions.

A way forward

Creating a global food system index could improve tracking and monitoring of countries' progress toward a desired food system. Given the cursory exploration of existing indices, such an index would add value to those interested in a holistic measure of the status and progress of a country's food system in an easy to understand fashion (see Figure, which depicts the status of the food systems of two hypothetical countries). No such index exists, and we can work toward filling this niche for tracking food systems, particularly against development goals such as the upcoming SDGs.

Figure: Example depiction of the GFSI for two hypothetical countries



There are possible approaches to construct the GFSI. While it is tempting to aggregate all six dimensions into a composite index that ranks national food systems, there is no clear methodological basis to do so. "Ranking" countries in one overall index is generally found adverse to initiating an open discussion on the various strengths and weaknesses of a country's food system, and frequently leads to a methodological discussion instead. At the same time, a composite score is preferred for attracting attention to the Index and to food systems

assessment. It also helps countries in assessing the progress, or backsliding of their own food system over time.

The GFSI user interface will provide an accessible snapshot of a country's food system in the form of a "dashboard" with scores on each dimension. It will also provide functionality to assign weights to each dimension, thus allowing users to construct their own composite index. Lastly, it will provide functionality to graph the development of food system scores per country over time, both on individual dimensions and on composite level. The GFSI team will experiment with a weighting system by itself, and publish a weighting system arriving at a composite score if and when a clear methodology for assigning weights has been established. One of the options here is to take the average of weights proposed by a list of experts (to be advised by the GFSI expert panel). The weighting model can be further adjusted based on the outcomes of uncertainty and sensitivity analyses. This approach aims to secure transparency of the methodology while improving robustness of the resulting model.

Already, many existing indicators explicitly draw from each other by incorporating elements of indexes or entire indexes into their own index. Indicators that have already been used and validated by other organizations will be considered first to avoid duplication of effort. An exercise to further map potential indicators against existing indicators and indexes is being undertaken. The exercise will also help the global food system index position itself to fill gaps and complement other indexes that offer non-food system insights.

The selection of indicators will in large part depend on data availability and frequency and coverage of data collection. Indicator selection and data collection for the GFSI will be aligned with and learn from other initiatives, including the data gathering initiative for the SDGs. Ultimately, to improve measurement toward a desired global food system, efforts and resources should also be concentrated on supporting an index that integrates new and timely data for each of the six dimensions of the global food system. Ongoing efforts to develop statistical capacity and generate new data in developing countries will be leveraged.

Ultimately, to improve the measurement toward a desired food system, efforts and resources must also be concentrated on supporting an index that integrates new and timely data for each of the six dimensions of the food system. Ongoing efforts to develop statistical capacity and generate new data in developing countries should be leveraged.

Table: Selected indexes and indicators related to the global food system

Index/Indicator	Org	Description	# of indicators	Countries covered	Overlap with Global Food System Index components					
					Productive and resource efficient	Socially sustainable	Nutritious and healthy consumption	Environmentally sustainable	Market dynamics	Enabling environment
The Global Food Security Index (GFSI)	DuPont and EIU	Assesses country-level food insecurity by affordability, availability, and quality	28	109	x		x	x	x	x
Global Hunger Index (GHI)	IFPRI	Measures and tracks hunger and nutrition insecurity globally, by region, and by country	3	120			x			
Rice Bowl Index	Syngenta	Detects country-level price shock vulnerability	33	14	x			x	x	x
The Nutrition Barometer	World Vision	Assesses govs political, legal, and financial commitments to ending undernutrition	13	36			x			
Hunger Reduction Commitment Index	IDS	Assess political commitments, transparency, and accountability, and their links to hunger and undernutrition reduction	22	45		x	x			
Food Security Risk Index	Maple-croft	Assess risk from lack of access to basic staples	18							
Food Security Vulnerability Indices	IFPRI	Detects country-level price shock vulnerability					x		x	x
Women's Empowerment in Agriculture Index	IFPRI, UASID, OPHI	Track change in women's empowerment levels; performance monitoring and impact evaluations	6	13-19		x				
Climate Smart Agriculture (CSA) Indicators	World Bank	Assesses readiness mechanisms and helps countries mainstream climate smart agriculture in development	13	88				x		
Agricultural Science and Technology Indicators (ASTI)	IFPRI	Provides data and analysis on ag R&D systems		70	x	x				
Access to Nutrition Index (ATNI)	Access to Nutrition	Assesses world's largest food and bev manufacturers on nutrition-related commitments, practices and performance	5	3					x	x
Bertelsmann Stiftung Transformation Index (BTI)	Bertelsmann Stiftung	Measures quality of democracy, a market economy and political management	49	129						
Global Gender Gap Index	WEF	Measures gender gaps across health, education, economy and politics	14	142						
Gender Inequality Index	UNDP	Measures gender inequalities in reproductive health; empowerment; and economic status	7	187		x				

Human Development Index (HDI)	UNDP	Measures average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living.	4	187							
FAO Food Security Suite of Indicators	FAO	Aims to capture various aspects of food insecurity including availability, access, stability, and utilization	43	153			x				
Agribusiness indicators	World Bank	Aims to measure progress toward productive, modern, and market-oriented farming sectors	44 - 54	9 (80 planned)	x					x	x
Additional indexes, indicators, and tools for future review and possible inclusion											
Footprint for Nations	Global Footprint Network	Resource accounting tool that helps countries understand their ecological budget									
Earth Security Index	Earth Security Group	Connects to sustainability dimensions of food systems within overall development and change									
Human Security Index											
The Food Index	Oxfam	Country food outcomes according to access, availability, and utilization									
Environmental Performance Index	NASA	Trends for core set of environmental outcomes linked to policy goals									
Global Compact 100 Index	UN Global Compact	Index of companies based on principles of leadership commitment and profitability									
Corruption Perceptions Index	Transparency Intl.	Measures how corrupt a country's public sector is perceived to be									
Inclusive Wealth Index	Inclusive Wealth Project	Measures countries' wealth in terms of progress, well-being and long-term sustainability									
Better Life Index	OECD	Well-being across 11 indicators of material living conditions and quality of life									
Ease of Doing Business	World Bank	Assesses regulatory environment as being conducive to the starting and operation of a local firm									
Global Yield Gap and Water Productivity Atlas	Global Yield Gap Atlas	Measures yield and water productivity gaps									
Knowledge Economy Index	World Bank	Measures a country's overall preparedness to compete in the Knowledge Economy (KE)									
Enabling the Business of Agriculture	World Bank	Various indicators on agribusiness enabling environment in http://eba.worldbank.org/~media/WBG/AgriBusiness/Documents/Reports/2016/EBA16-Full-Report.pdf									