Five Capitals Food System Resilience Score Analysis Tool

Abstract: The food system is a complex web of actors/agents and interactions that spans production to the consumption of food. The global food system has been severely disrupted by the COVID-19 pandemic putting millions of people at risk of hunger and malnutrition. In a post-COVID-19 era, a stock-take will be required to see how our food system changed in response to current drivers/pressures and what lessons we learnt regarding the actions required to improve its resilience. The ability to understand, interpret, evaluate, and monitor key aspects of the food system is pivotal in building resilient food systems, as it is through this collection and analysis of information that we can improve resource allocation and effective decision-making. Thus, we present a diagnostic tool that can identify and monitor food stress using a food system resilience score. This score is derived from several indicators that describe natural, human, social, financial, and manufactured dimensions of the food system. The tool incorporates three major functionalities - situational awareness, scenario analysis, and intervention analysis. The situational awareness component helps derive a clear understanding of the strengths and weaknesses of food systems, while the scenario analysis component enables the anticipation of how various aspects within food systems may change when exposed to food shocks. The intervention analysis component points out the most effective and realistic interventions against anticipated food shocks. We have constructed the tool so that it can be deployed at various levels to enable better-informed decision-making toward building resilient food systems in the long term.

A. Using the tool

1. Home Page

It displays the world map colored based on the selected indicator on the ***Control Center***. The world map shows the scores of the countries for various indicators, capitals, and the overall food system resilience. The world map is an animated visualization that displays the scores spanning multiple years.

2. Functionalities

2.1 Situational Awareness

The component helps derive a clear understanding of the strengths and weaknesses of national food systems. The world map, descriptive analysis and comparative analysis serve to enable situational awareness.

2.1.1 World Map

This component is displayed as the home page for the tool which displays animated and annotated world map based on the scores of countries for several indicators. The world map can be customized by selecting desired indicator in the ***Control Center***.

2.1.2 Descriptive Analysis

This component summarizes the strengths and weaknesses of a national food system when the analysis is chosen by “Country”. When the analysis is chosen by “Indicator”, the component lists the best performing and the worst performing countries for the chosen indicator(s). The visualizations can also be customized for analysis years and multiple selections of countries and indicators.

2.1.3 Comparative Analysis

This component facilitates comparisons of performance of national food systems at a temporal scale. The visualizations in this component can be chosen by either "Country" or "Indicator". The visualizations also allow for multiple selections of countries and indicators. Five different types of analyses are available in the component.

1-year Analysis: It draws a picture of the current strengths and weaknesses of a national food system when the analysis is chosen by "Country" and the current best performing and worst performing countries when the analysis is chosen by "Indicator" compared to that in the previous year.

5-year Analysis: It draws a picture of the current strengths and weaknesses of a national food system when the analysis is chosen by "Country" and the current best performing and worst performing countries when the analysis is chosen by "Indicator" compared to the statistics five years ago.

YTD Analysis: It draws a picture of the current strengths and weaknesses of a national food system when the analysis is chosen by "Country" and the current best performing and worst performing countries when the analysis is chosen by "Indicator" compared to the earliest statistics (2012).

Country vs Country: It directly compares a country against other and shows how the scores of the countries in five capitals including overall food system resilience have changed at a temporal scale.

Capitals: It displays the performance of chosen countries for all indicators within the selected capital at a temporal scale.

2.2 Scenario Analysis

This component helps anticipate how national food systems may change when exposed to food shocks with quantified shock intensity. When the scenario analysis is selected at a global scale, the component first displays the global vulnerability of the selected food shock, i.e., the most affected and the least affected nations and then the most resilient and the most vulnerable nations with the estimated percentage change (%) annotated in the visualization. When the scenario analysis is selected at a national scale, the component first displays the cumulative standardized impact scores of all food shocks for a selected range of years and then the most resilient and the most vulnerable indicators of the national food system for the chosen country.

2.3 Best Interventions

This component lists the most realistic and effective suite of interventions for a selected national food system based on historical data and expert opinions for any food shocks quantified with shock intensity. The component displays the suite of interventions ranked based on the effectiveness score for "Users" while the component asks the experts to express their opinions on the possible interventions for a quantified food shock scenario when the component is chosen for "Expert" users. Once the experts complete sharing their expert knowledge, the experts can also view the ranked suites of interventions.

3. Five Capitals based framework for food system resilience assessment

The five capitals approach provides a holistic way to measure value.

Table 1: Categorization of the variables under five capitals

Capitals	Capitals categories	Variables
Natural	Biodiversity	Biodiversity Status
Biodiversity		Ecosystem
Air quality		Forest Area
Water quality	Air quality	GHGE per capita
Land quality	Water quality	Water availability
		Water quality
		Water footprint
	Land quality	Total Arable land per capita
		Land degradation per arable land
Human	Wellbeing	Obesity
Wellbeing		Undernourishment
Skills and training		Foodborne diseases burden
		Drinking Water
		Micronutrient Availability
		Protein availability
		Food diversity
	Skills and Training	Literacy rate
		HDI
		Labor participation rate
		Population growth rate
Social	Equality for all	Gender equity
Equality for all		Income equity
Public services	Public Services	Urban absorption capacity
Community engagement		Nutritional Standards
local political institution		Food policy
	Community engagement	Public-private collaboration
		Food safety net
	local political institution	political stability risk
		corruption
		conflict
Financial		
Governance	Governance	Agricultural education and resources
Financing		Agricultural import tariffs
Whole life value for money	Financing	Per capita income
Wider economic impacts		Agricultural GDP
		Access to financing for farmers
	Whole life value for money	Food expenses
		Food price volatility
		Food loss and waste

	Wider economic impacts	Agricultural R&D
		Adaptation of new technologies
Manufactured	Energy and carbon	Energy footprint
Energy and carbon		Carbon footprint
Climate change and resilience	Climate change resilience	Climate smart agriculture
Resource efficiency		Disaster management system
Physical assets and services	Resource efficiency	Sustainable nitrogen use index
		Globalization
	Physical assets and services	Access to quality seeds
		Telecommunications
		Transportation
		Food storage and facilities
		Irrigation