Vulnerability and Resilience: Developing Metrics to Measure Sustainable Diets and Food Systems

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Abstract

Background
Recurrent food crises and climate change, along with habitat loss and foodborne disease outbreaks, have put food security and environmental sustainability at the top of the political agenda. Analyses of the dynamic linkages between food consumption patterns and environmental concerns have recently received considerable attention from the international and scientific community. Sustainable diets and food systems have emerged as a critical issue and promising avenue for research.

In particular, the Mediterranean region, as a geographically interlocked and heterogeneous area, presents several conditions of vulnerability related to food insecurity and unsustainability of the food system. Poor dietary intakes and nutritional transition, leading to the double burden of malnutrition (over and under-nutrition), are closely linked to demo-spatial and socio-economic dynamics, but also to agricultural policies, production systems and food chain characteristics. Similarly, environmental conditions are endangered because of the strong natural resources exploitation by the current agro-food system to satisfy contemporary food consumption behaviors. Policy-makers need evidence-based information to monitor public policy interventions towards sustainable food systems.

Objective

Indicators are essential in informing action and/or in policy maker decision aid, but concepts, methods and metrics need to be linked in a coherent and systematic way for a multidimensional joint analysis of food and nutrition security and environmental sustainability. Using the lens of a wide sustainability concept, this conceptual paper aims at developing a multidimensional framework, applicable to the Mediterranean countries, to evaluate the sustainability of food systems and diets.

Methods

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Derived from natural disaster and sustainability sciences, the framework is developed following two lines: a vulnerability-based approach, enhanced by inputs from the resilience literature, and an analysis of the key issues or pillars of food and nutrition security in Mediterranean countries. This coupled issue/vulnerability approach results in a coherent structure that disentangles exposure, sensitivity and capacities to respond to specified disturbances or drivers of change. Resilience helps further framing coping, adaptation and transformation possible strategies, and provides the concepts to capture by selecting proxy indicators. A DELPHI technique is applied in order to select the final cluster of indicators. Use of participatory and consensus-based approaches allows implementing assessments beyond subjective considerations. The subsequent framework improves the design of information systems or metrics assessing the joined environmental, economic, social and health dynamics of food systems.

**Results**
The region-specific attributes are multidimensionally identified through the issue-based contextualization, highlighting how food system-related phenomena occur. Acknowledging the systemic dimension of sustainability, the vulnerability/resilience approach allows considering the causal factors dynamics, instead of targeting only final outcomes. The assessment of food insecurity and environmental unsustainability can be expressed through the language of vulnerability and resilience, as the degree to which a country is exposed and sensitive to causal critical phenomena, and the extent of its ability to respond. The identification of the key drivers of change in the Mediterranean food system highlights cutting-edge prospective challenges for food security and promotes regional decision-making solutions.

**Keywords:** Food security, Sustainability, Resilience assessment, Frameworks, Decision, making, Disturbance, Feedback