

Sustainability and Food & Nutrition Security: A Vulnerability/Resilience Framework for Food Systems

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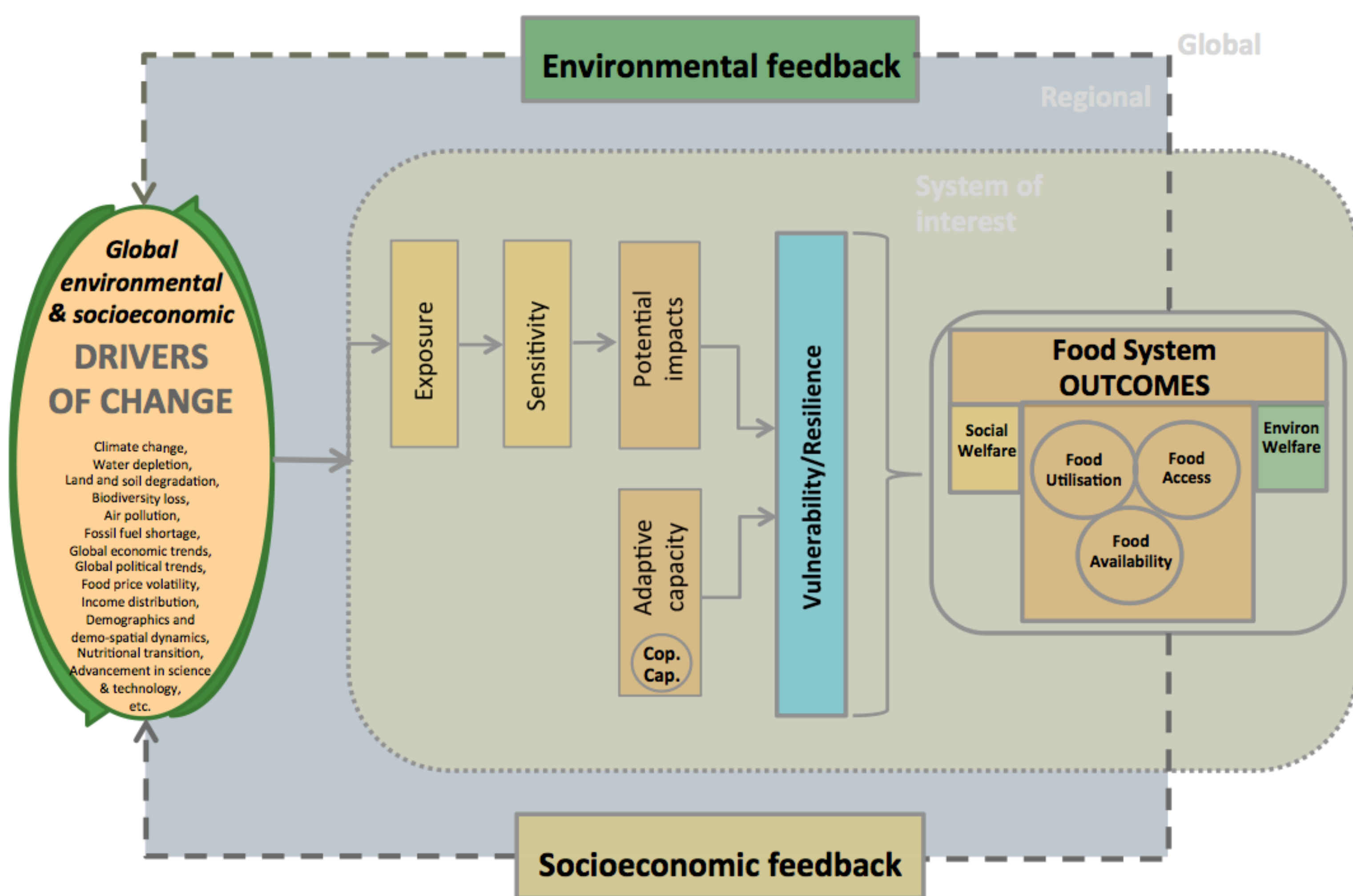
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① AIMS

- Address gaps in our understanding of what constitutes **Sustainable Diets** and how it relates to food systems
- Help build a **common language** among the scientific community on Sustainable Diets and Food Systems
- Identify a multidimensional framework for **developing metrics** and guidelines aimed at **measuring the sustainability of diets and food systems**, formalizing and operationalizing the abstract and multidimensional concepts of sustainable food systems



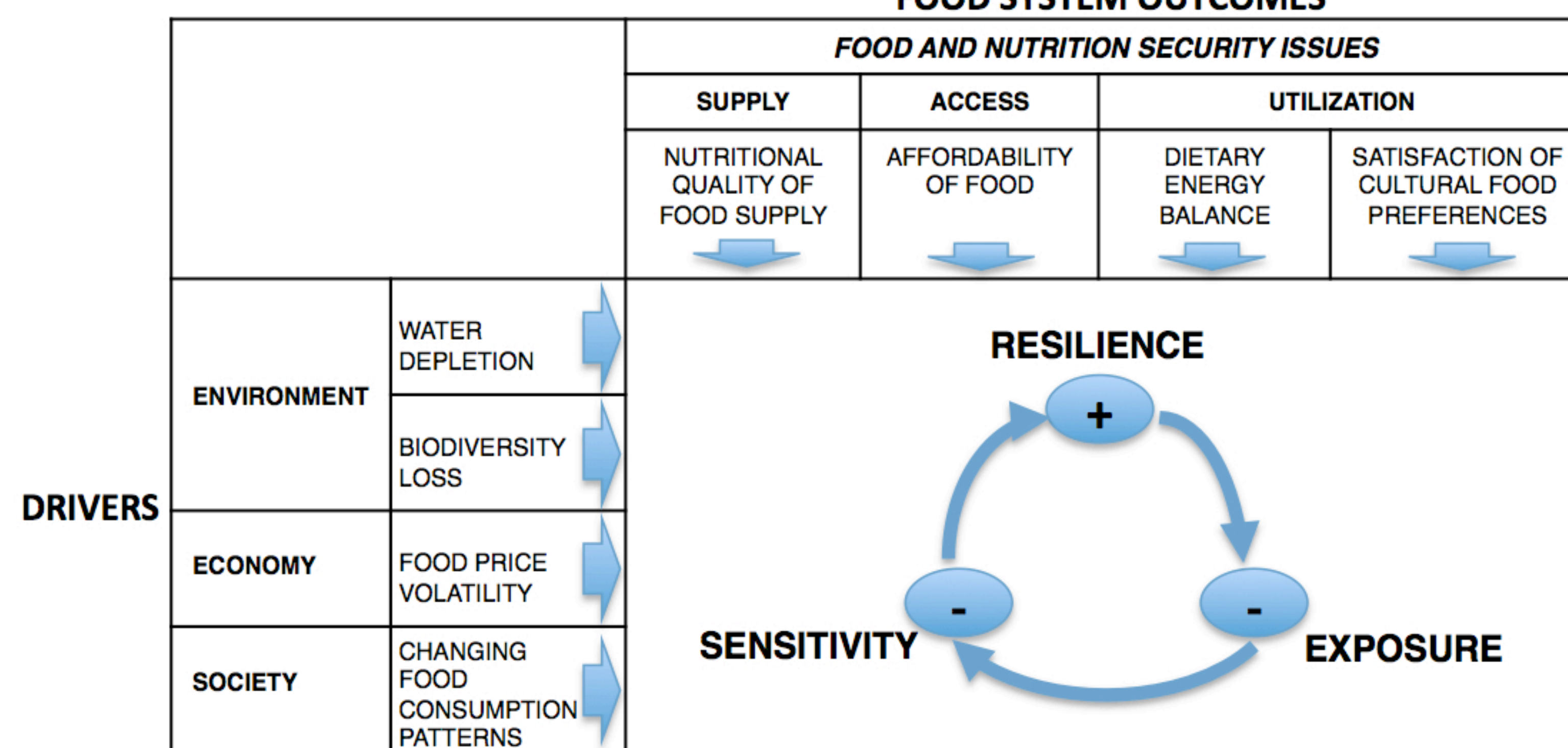
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Allen & Prosperi, 2015 (Adapted from Ingram et al., 2010; Prosperi et al., 2014; Turner et al., 2003)

② METHODS

- Sustainability** is the ability of a system to maintain and enhance its essential functions over time
- The theories of **vulnerability and resilience**, within the social-ecological systems frameworks, were applied in order to analyze the sustainability of critical food and nutrition security issues over the time
- Following the steps of the global change vulnerability/resilience assessment, a **causal factor analysis** is developed
- Formulating "**what is vulnerable to what**" hypotheses allows to identify specific causal models of vulnerability disentangling **exposure, sensitivity and resilience**
- A three-round **Delphi methodology** was applied to select indicators on the basis of the vulnerability/resilience theoretical framework for food systems

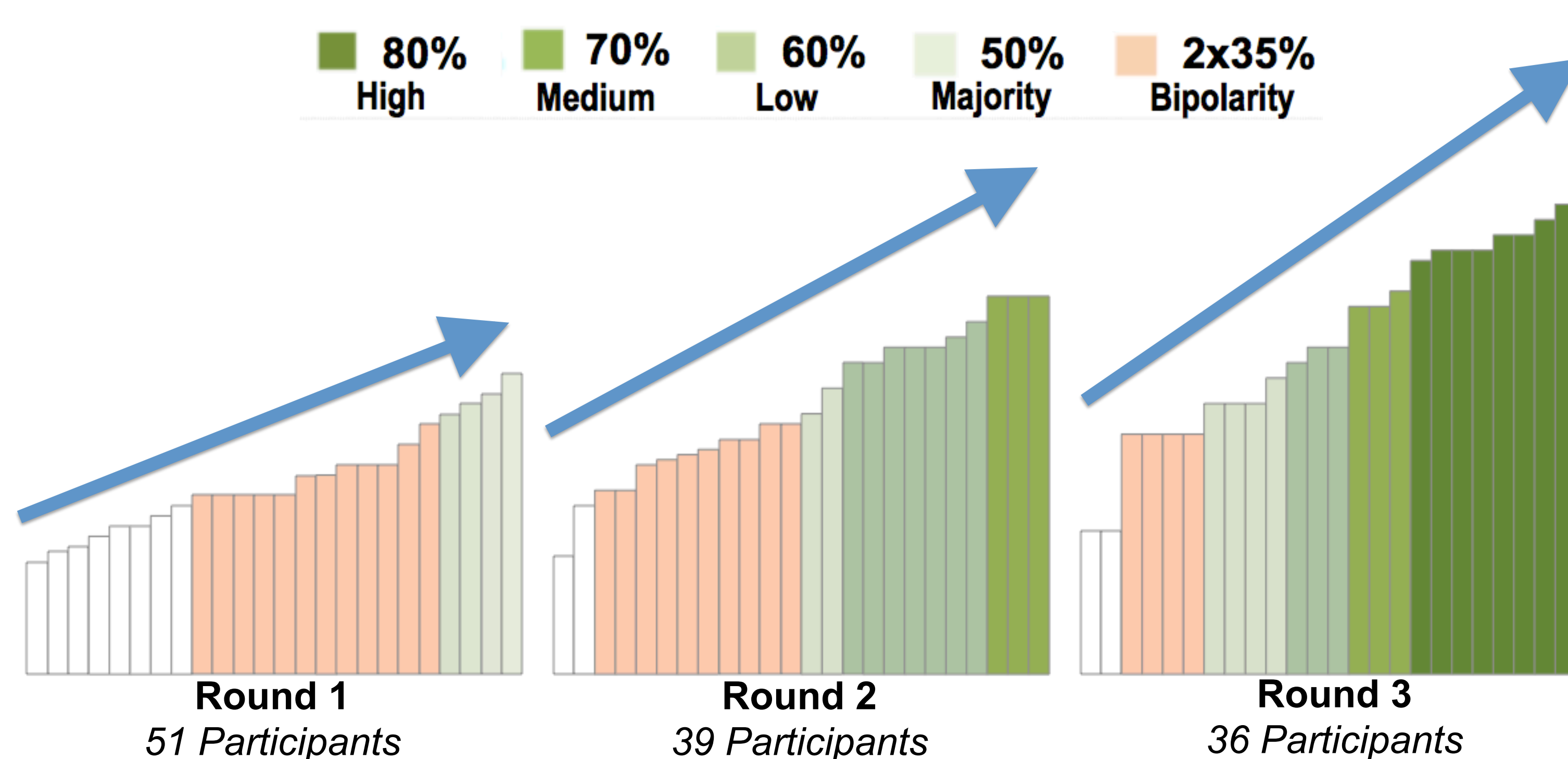


④ FINDINGS

- A feedback-structured framework of the food system formalized 8 causal models of vulnerability/resilience and identified the direct context-specific interactions between **4 socioeconomic and biophysical drivers of change** and **4 food and nutrition security issues**
- The Delphi study has progressively revealed low, medium, and high **consensus** and majority level on **18 indicators (75%)** out of the initially targeted 24 indicators
- 8 indicators have met the high threshold consensus criteria ($\geq 80\%$)
- 3 indicators have met the medium threshold consensus criteria ($\geq 70\%$)
- 3 indicators have met the low threshold consensus criteria ($\geq 60\%$)
- 4 indicators have been selected by the majority of the participants ($\geq 50\%$)
- For 4 dimensions, clear bipolarity can be reported

③ STUDY DESIGN

- Develop a **Framework**
- Review** and list 1,500 **indicators** specific to the subregional geographical area identified (Mediterranean "Latin Arc": Spain, France and Italy)
- Focus groups**: Set up a small multidisciplinary panel of experts to discuss the framework, shortlist **136 potential indicators** and test an online questionnaire
- Delphi online survey**: Set up a large and balanced panel of experts to discuss the framework and identify a suite of 24 indicators over 3 rounds (Mar.-Jul. 2014)



⑤ CONCLUSIONS

- A **reduced pool of metrics** was obtained through a structured, rigorous and participative expert-based elicitation process, moving beyond subjective and individual evaluation and **reaching consensus** on metrics of sustainable diets and food systems for **supporting decision-making**
- Extra drivers of change were proposed by panelists to be analyzed, in particular: **Changing agrifood patterns; Policy actions; Technological innovation**
- Extra food and nutrition security issues were also proposed, in particular: **Environmental externalities; Social equity**
- This process implied strong **transdisciplinary participation** with experts in metrics, nutrition, economics, ecology, agriculture, policy and sustainability science
- Operationalizing vulnerability and resilience through indicators** contributes to analyze the socioeconomic and biophysical interlinkages underneath the sustainability of diets and food systems and **to assess the joined environmental, economic, social and health dynamics of food systems**
- Consensus and joint efforts on information for policy-makers are key**

WATER DEPLETION → NUTRITIONAL QUALITY OF FOOD SUPPLY

EXPOSURE	Water Footprint of nutrient-dense foods [m ³ /kg]
SENSITIVITY	Intensity of use of actual water resources [%]
RESILIENCE	Irrigation Water Efficiency Index [%]

BIODIVERSITY LOSS → NUTRITIONAL QUALITY OF FOOD SUPPLY

EXPOSURE	% of total acreage of top 5 varieties
SENSITIVITY	Nutritional Functional Diversity
RESILIENCE	Crop Agrobiodiversity Factor

WATER DEPLETION → AFFORDABILITY OF FOOD

EXPOSURE	Water Footprint for an average diet [m ³ /yr]
SENSITIVITY	Price index for 10 most water-demanding foods

BIODIVERSITY LOSS → SATISFACTION OF CULTURAL FOOD PREFERENCES

SENSITIVITY	% of diets locally produced
RESILIENCE	Integration of biodiversity considerations in business

FOOD PRICE VOLATILITY → NUTRITIONAL QUALITY OF FOOD SUPPLY

EXPOSURE	% of nutrient intakes from 10 most volatile foods
RESILIENCE	Household Dietary Diversity Score

FOOD PRICE VOLATILITY → AFFORDABILITY OF FOOD

EXPOSURE	% of food household expenditure
SENSITIVITY	Sensitivity to price volatility
RESILIENCE	Presence of safety net programs

CHANGES IN FOOD CONSUMPTION PATTERNS → NUTRITIONAL QUALITY OF FOOD SUPPLY

EXPOSURE	Food Purchasing Power Index
SENSITIVITY	Household Dietary Diversity Score

CHANGES IN FOOD CONSUMPTION PATTERNS → DIETARY ENERGY BALANCE

SENSITIVITY	Prevalence of overweight & obesity [%]
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