

Chapter 5 – Systems thinking for agri-food systems, and the need for a universal and comprehensive valuation framework

Transitioning chapter

- Viewing ecosystems, human systems and agri-food systems as an interconnected whole rather than as independent domains for ‘silo’ analysis.
 - boundary, scales (spatial and temporal), contexts, and interactions among sub-systems
 - Drivers of change both external and internal to the system
- Exploring the implications of systems thinking on the question of what to value and why, i.e., ‘framework’.
 - Discussing successful evaluation frameworks across diverse contexts
 - Merits and limitations of the proposed framework
 - Lexicon as a universal guide for evaluating agricultural systems, practices, products, policy scenarios

Key concepts of system thinking

- Way of thinking to organize system components and interactions
- Language to describe what we need to represent in the framework
- Systems thinking is about thinking in connections, relationships rather than in parts
- Understanding relationships between system structure and behavior
- System, and complex; as opposed to siloed stages and processes
 - NSF: The FEW systems must be **conceptualized broadly**, incorporating physical processes (such as built infrastructure and new technologies for more efficient resource utilization), natural processes (such as biogeochemical and hydrologic cycles), biological processes, social/behavioral processes, and cyber-components. **Investigations of these complex systems may produce discoveries that cannot emerge from research on food or energy or water systems alone. It is the synergy among these components in the context of sustainability that will open innovative science and engineering pathways to produce new knowledge, novel technologies and predictive capabilities to solve the challenges of scarcity and variability.**

System thinking

- Value chain perspective
 - The entire **lifecycle and the various sequential stages** in agricultural value chains that need to be considered in order to comprehensively assess eco-agri-food systems, i.e. 'production', 'processing and distribution', and 'consumption'.
 - ✓ Ecosystems' contribution to ag
 - ✓ Agriculture as an integrated process and action of both human systems and natural systems in order to produce food
 - ✓ Processing, distribution and consumption for the desired outcomes (nutrition, and cultural needs/way of life, employment/value-added, food sufficiency, etc.)
- BUT more than a one-way direction
 - bring into visibility, e.g., feedbacks
 - discover opportunities and entry points for solutions (e.g., role of consumers)

System thinking: boundary, scales, contexts, and interactions

- Boundary:
 - So broad that everything can be internalized?
 - What are the important adjacent systems (e.g., energy, water, health, education)
- FHI360:
 - Know your adjacencies: Identify adjacent sectors that are related to your area of interest. These sectors will represent the best opportunities for using integrated approaches to reach your goal.
 - Act on adjacencies: Determine how to leverage those adjacencies and create a plan of action.
 - Putting the adjacencies into action can be facilitated by tools that foster multi-disciplinary collaboration, such as the System-wide Collaborative Action for Livelihoods and Environment (SCALE+) methodology. SCALE+ is a systems methodology to accelerate broad stakeholder engagement in sustained collaborative action to address a complex development issue.
 - Think system, map system, integrate system, transform system, measure results
- Other frameworks :
 - “Donut economy (Kate Raworth)” a visual framework for sustainable development – shaped like a doughnut – by combining the concept of planetary boundaries with the complementary concept of social boundaries.
 - F-E-W nexus (shared stressors, Interconnections and interdependencies associated with the nexus)
 - Complex, coupled human-nature systems (coupled processes of society and the environment)
 - Socio-Environmental (S-E) Systems: human systems, environmental systems, and coupling variables (e.g. Natural hazards, Ecosystem services, Land use, Global warming, Conflict)

From systems thinking to the question of “why a **comprehensive and universal** valuation framework?”

- Different systems (--different forms, typologies, cultural features & socio-economic contexts of agri-food systems) occurring at different scales
- Common framework: allow comparison; link to other economic sectors
- Capable of being applied on a globally consistent basis: comparability
- → allow policymakers, citizens, and businesses to identify
 - the various points in the value chain where the most significant impacts (both positive and negative) occur.
 - The costs and benefits of alternative systems
 - The tradeoff of shifting from one system to another

"A system is set of things - people, cells, molecules - interconnected in such a way that they produce their own behavior over time"

Donella Meadows

"Managers are not confronted with problems that are independent of each other, but with dynamic situations that consist of complex systems of changing problems that interact with each other. I call such situations messes. ... Managers do not solve problems, they manage messes."

- *Russell Ackoff*