Faculty of Design

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Systems thinking in food security research

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Systems Thinking in Food Security Research

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Overview

- Definitions
- Food Security Policies
- Systems Thinking in Food Security Research
- Discussion
- Conclusions

Food and Agriculture Organization of the United Nations

Definitions

- **Food Security**
  "Food security exists when **all people**, at **all times**, have **physical** and **economic access** to **sufficient**, **safe** and **nutritious food** that meets their dietary needs and food preferences for an **active** and **healthy life**."

- **Food Systems**
  "Food systems encompass the entire range of **actors** and their interlinked value-adding **activities** involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from **agriculture**, **forestry** or **fisheries**, and parts of the broader **economic**, **societal** and **natural environments** in which they are embedded."

- **Sustainable food system**
  "A sustainable food system is a food system that delivers **food security** and nutrition for all in such a way that the **economic**, **social** and **environmental** bases to generate food security and nutrition for future generations are not compromised."

Food Security Policies

- **United Nations**
  - Sustainable Development Goals
- **European Union**
  - The Bioeconomy Strategy | Food2030
  - The European Green Deal | FarmToFork Strategy

Systems Thinking in Food Security Research

Indicative papers from:

Environment

Food Security & Nutrition

Sustainability

Science & Engineering

Design

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Environmental

Ericksen 2008 "Conceptualizing Food Systems for Global Environmental Change Research"

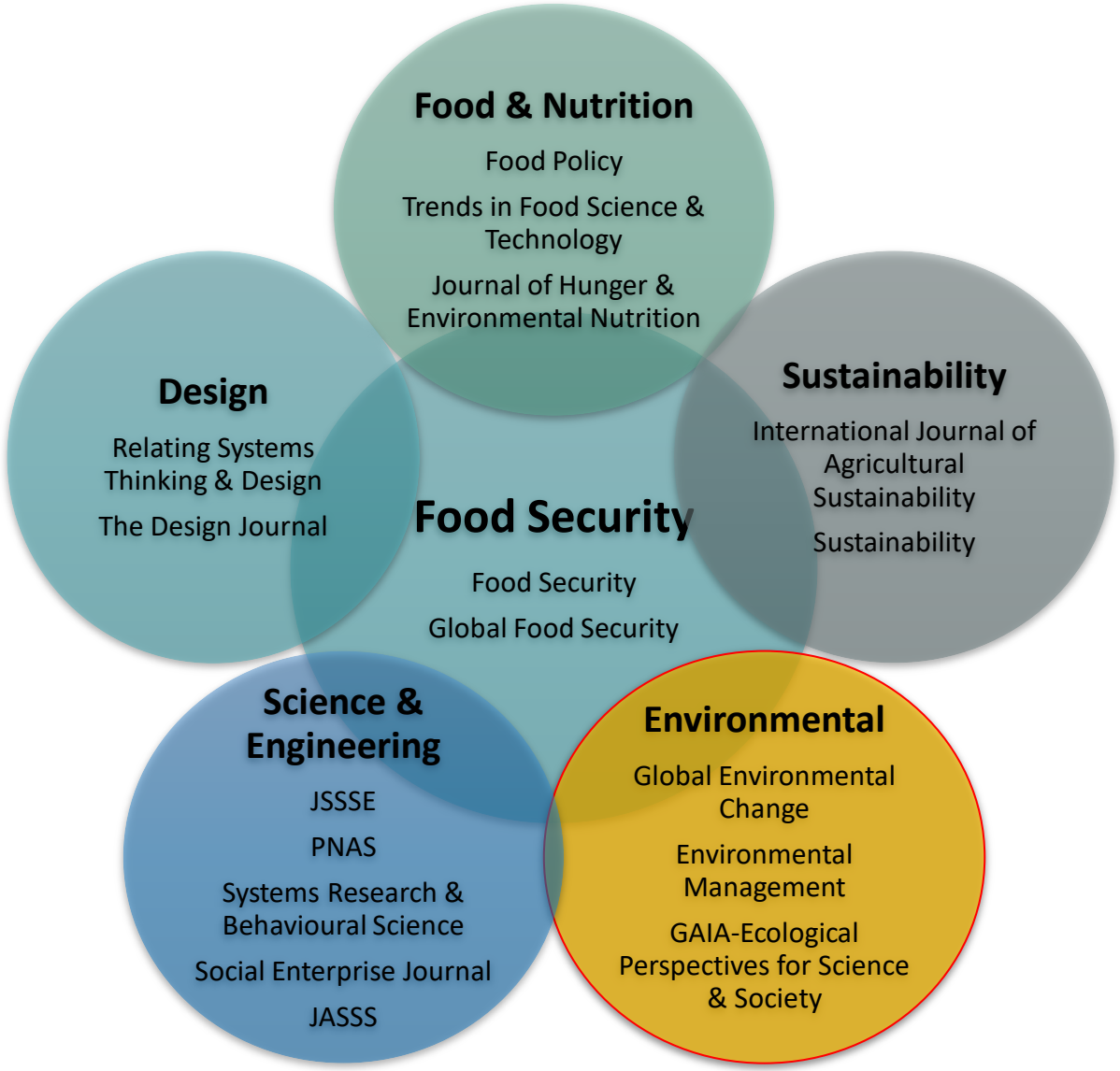
- ✓ A pioneer, broadly cited, food systems' conceptual framework, part of the Global Environmental Change and Food Systems (GECAFS) Project, that could lead to a database of interactions typologies

Allen and Prosperi 2016 "Modeling Sustainable Food Systems"

- ✓ System dynamics modeling of food system's vulnerability and resilience factors

Grant et al. 2018 "Tackling Food System Challenges through Experiential Education"

- ✓ A holistic conceptual framework for a food system course, integrating design and systems thinking, bringing young leaders and stakeholders together to codevelop sustainable solutions



Food Security & Nutrition

Ingram 2011 "A food systems approach to researching food security and its interactions with global environmental change"

- ✓ An introduction of the GECAFS conceptual framework to the food security research community

Horton et al. 2017 "An agenda for integrated system-wide interdisciplinary agri-food research"

- ✓ A method for modeling agri-food systems that allows quantitative analysis, complemented by a deliberative fora approach to address the ethical, legal, and political tensions

Fleischer et al. 2018 "Using systems science to gain insight into childhood food security in the United States: Report of an expert mapping workshop"

- ✓ A qualitative systems mapping of childhood food security suggested as a basis for a quantitative simulation model

Sustainability

Bland and Bell 2007 "A Holon Approach to Agroecology"

- ✓ Holon, viewed as an intentional entity within an ecology of contexts, addresses the boundary and change dilemmas, and flickering helps in seeing both its system and part nature

Zurek et al. 2018 "Assessing Sustainable Food and Nutrition Security of the EU Food System—An Integrated Approach"

- ✓ SUSFANS, a Horizon 2020 project modelling the EU food system with stakeholders' participation, visualizing policy metrics including social equity, and urging for a conceptualization of social equity mechanisms

Grant et al. 2019 "The Rich Picture Method: A Simple Tool for Reflective Teaching and Learning about Sustainable Food Systems"

- ✓ Using rich pictures to help in visualizing complex systems' understanding and thus in evaluating learning during a sustainable food systems course for decision makers

Science & Engineering

Hipel et al. 2010 "System of Systems Approach to Policy Development for Global Food Security"

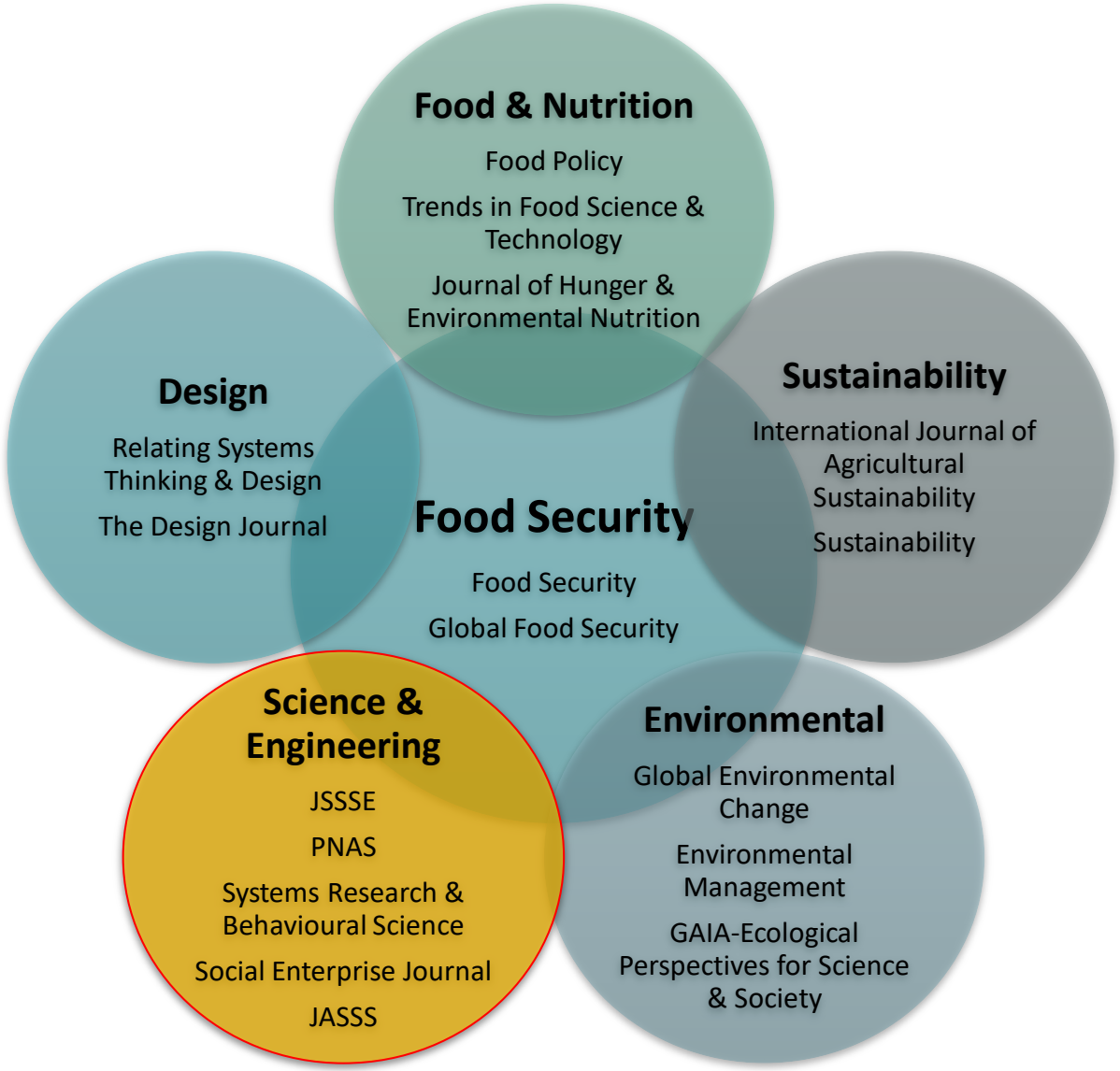
- ✓ Ethics and values systems in food policy making viewed from a systems engineering perspective

Banson et al. 2014 "A Systems Thinking Approach to Address the Complexity of Agribusiness for Sustainable Development in Africa: A Case Study in Ghana"

- ✓ Agricultural industry system dynamics modelling based on stakeholders' mental models using the systems-based Evolutionary Learning Laboratory process

Zivkovic 2017 "Addressing food insecurity: a systemic innovation approach"

- ✓ Food security governance networks can develop steering strategies that enhance the adaptive capacity of their solution ecosystems



Design

Barbero 2015 "Systemic Design for Food Sustainability Interpretation of real cases and reflection on theories"

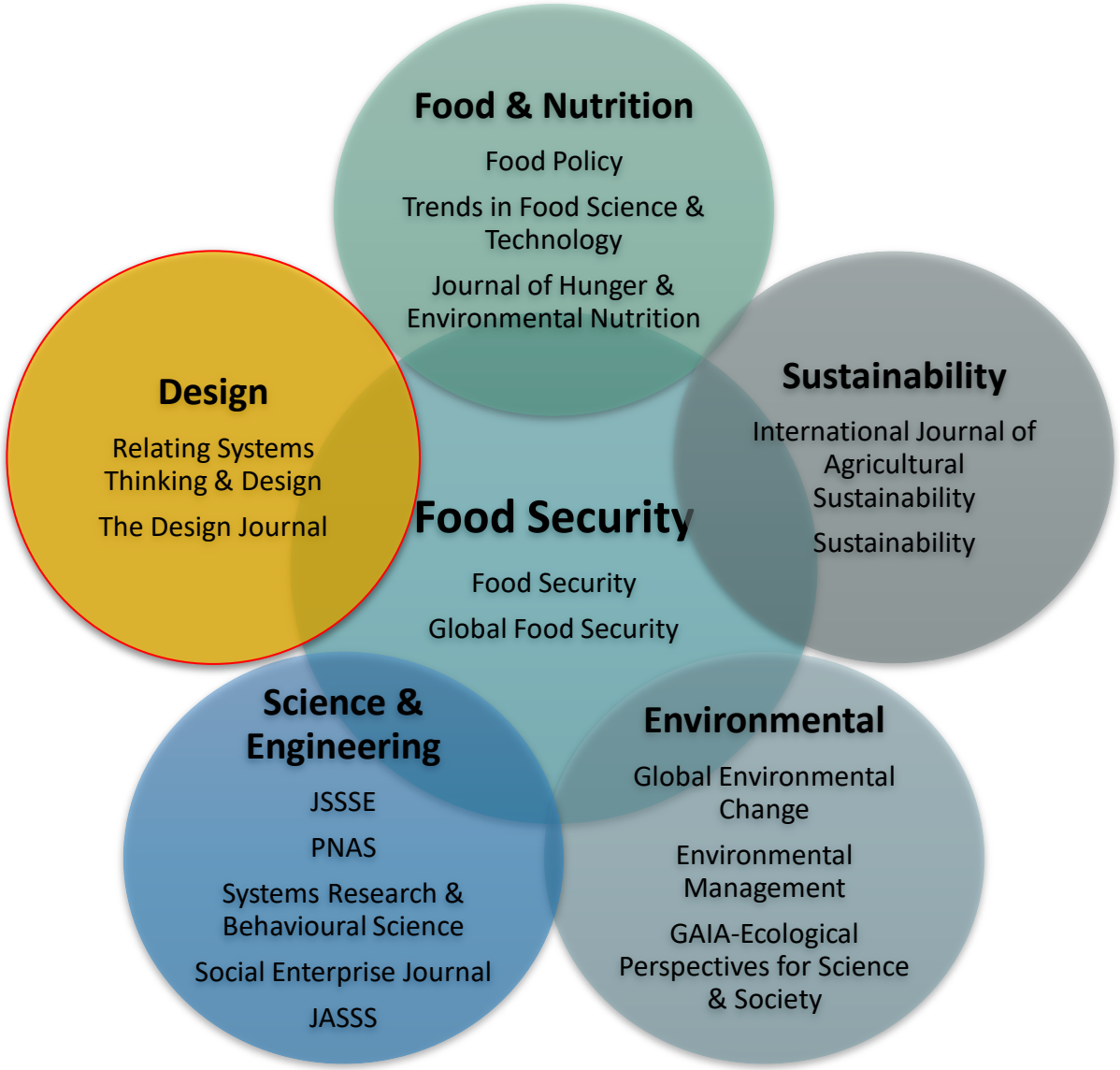
- ✓ A map of obstacles faced in food design interventions across the company-community-territory levels helps identify key food sustainability aspects

Darzentas et al. 2018 "Systemic design in food security and resilience: Building a holon"

- ✓ Collaborative design of the food's holon helps gaining an integrated knowledge of the food security challenge and gives rise to richer understandings of the food system's resilience

Nohra and Barbero 2019 "Systemic Design for territorial thinking. Circular urban transitions for post-industrial cities"

- ✓ Applying systemic design to support transitioning of the urban post-industrial area to a circular economy with sustainable consumption one of the key goals



Discussion

Assessing “Systemicity”

The paradox of disciplinary bias when applying systems thinking

Blending quantitative and qualitative approaches to research’s advantage

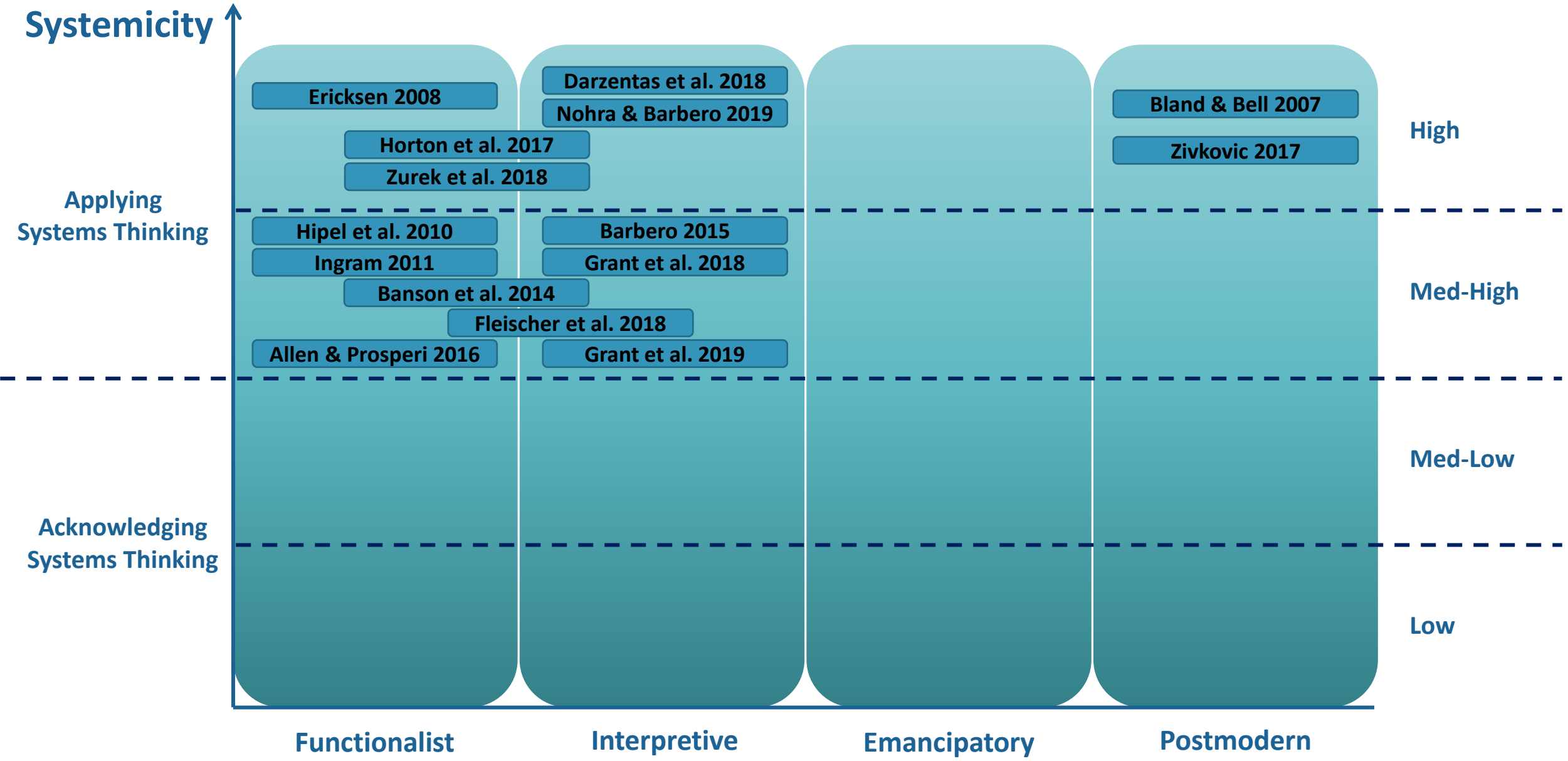
Assessing "Systemicity"

"Systemicity" scale

- ✓ **Acknowledging**
  - 1 Low: Simple acknowledgment, no significant systems awareness
  - 2 Med-Low: High awareness of systems concepts
- ✓ **Applying**
  - 3 Med-High: Simple application of systems
  - 4 High: Application and advancement of systems thinking

Social Theory Paradigms (following Jackson 2003 "Systems Thinking Creative Holism for Managers")

- Functionalist
- Interpretive
- Emancipatory
- Postmodern



The paradox of disciplinary bias when applying systems thinking

- Systems thinking is inherently inter- / trans-disciplinary and assumes transcending one's own disciplinary boundaries
- The majority of the food security researchers applied systems thinking largely influenced by, and showing preference to, their disciplinary tools (quantitative, qualitative)
- Systems science's clear presence across disciplines in the form of systemic tools, curriculum, and language would serve as a means of transcendence for researchers

Blending quantitative and qualitative approaches to research's advantage

- Quantitative approaches have the advantage of providing measurable empirical evidence, satisfying a fundamental need of the scientific method
- Qualitative approaches have the power of capturing non-measurable, yet perceivable, aspects of a problem
- A complementary combination of both would provide a holistic epistemological approach
- Recent modelling approaches progressively acknowledge limitations in ethical, legal, and political issues and begin to incorporate aspects of soft approaches, while soft systems adopters make efforts in generating a conceptual framework that can be modelled and/or numerically exploited
- Systemic Design could lead that effort applying design thinking to compose appropriate integration frameworks

Conclusions

- Systemicity assessment helps in visually mapping the food security research and serves as a guide for the Systemic Designers' approach to the food security research community
- Food security research and systemic design: Zivkovic already published in RSD proceedings and Grant et al. 2019, Bland and Bell 2007 are closer to embracing systemic design approaches
- Disciplinary tools' bias impedes systems thinking in practice
- Need for systemic tools, curriculum, and language across disciplines
- Need for a balanced combination of quantitative and qualitative approaches
- Systemic Design can lead the effort for quantitative qualitative integration frameworks

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Thank you

for your attention…

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