Innovating, Responsibly: Revolutionizing Agri-Food Systems for a Sustainable Future

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INTRODUCTION

By 2050, the human population is projected to reach 9.8 billion. In a paradox of our world, malnutrition and food insecurity coexist with excessive consumption and preventable waste. To remedy the agri-food system to feed future generations adequately, many believe a new approach must be taken for food and agriculture production and distribution. Society is on the precipice of, arguably already in, "Agriculture 4.0," or the fourth agricultural revolution, where emerging innovations will heavily influence and change agriculture production.

OBJECTIVES

Under the Cornell Food Systems and Global Change Wild Futures project led by Daniel Mason-D'Croz, the objectives of my research were to document emerging agri-food innovations and to identify the current literature surrounding the concept of responsible innovations in agri-food systems to "develop tools to inform food policy to harness the power of innovation while also building in rail guards to avoid their worst unintended consequences."

Figure 1. Innovative Food Systems Solutions (IFSS) operates a public portal of agri-food innovations. https://ifssportal.nutritionconnect.org/.

INNOVATION WRITEUP

The Innovative Food Systems Solution (IFSS) portal is an accessible online database of emerging agri-food systems innovations (Figure 1). My research utilized Scopus, Google Scholar, and Google databases for general reviews and specific studies. I reviewed the papers and condensed the information into a format that would allow the IFSS team to input it into their online portal. Each innovation write-up comprised multiple sections (Figure 2). I was the lead researcher in twelve innovation write-ups and the secondary researcher for two innovations. As the secondary researcher, I reviewed the work done by the primary researcher. I also backfilled 24 partially written innovations for the inventory (Figure 3).

General Information	Context Specificity	Current State of the Innovation
1. Solution ID	1. Geographic Constraints	1. Solution Readiness
2. Solution Name	2. Context Target	2. Current Use scale
3. Solution Description	3. Use as a Small Scale Producer	3. Current Use Notes
4. Impact Statement	4. Use as a Small Scale Consumer	4. Readiness to Scale scale
5. Metadata	5. Food System Typology	
	6. Supply Chain Segments	
	7. Potential Users	

General Implications	Specific Implications
1. Keywords	1. Dietary Impact Score and Narrative
2. UN SDGs	2. Environmental Impact Score and Narrative
3. Primary Intended Outcomes	3. Equity Impact Score and Narrative
4. Primary Concerns with Solution	4. Livelihood Impact Score and Narrative

Figure 2. A visual representation of the information in an innovation write-up for the IFSS portal broken into subcategories to illustrate form dynamics.

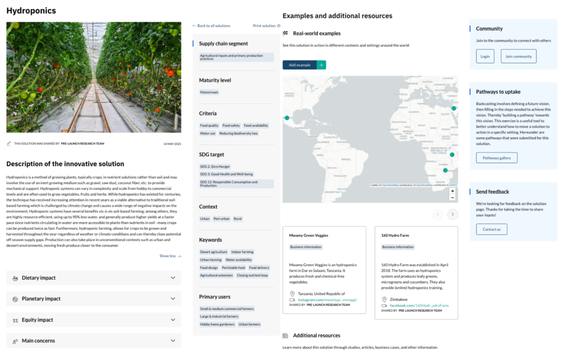

Figure 3. An example of an innovation on the IFSS portal.

ANNOTATED BIBLIOGRAPHY

Tasked with developing an annotated bibliography on "responsible innovation" to assist the team in a chapter they were writing on the topic (Figure 4), the focus of my work transitioned from singular innovation research to reviewing the overall concept of "responsible innovation." I employed specific search terms that were a niche, subsection, or in a tangential field to the topic, to develop a greater understanding of the area of knowledge (i.e., "frugal innovation" instead of "innovation.") In total, I included 76 articles in my annotated bibliography (Figure 5). By systemically assessing context-based development, implementation, and maintenance that considers individual requirements, local culture, environmental considerations, social progress, and economic sustainability, technologies evolve from "innovation" to "responsible innovation."

How the paper was identified?	Search Engine Used	Journal/ Source	Publication Year	Article	Summary	Key Words
Responsible and innovation and agriculture	Scopus	Sustainability (Switzerland)	2023	A Highly Condensed Social Fact: Food Citizenship, Individual Responsibility, and Social Commitment	Food as a "condensed social fact" brings together social, political, individual, and communal dimensions of food management and production. Through three case studies of organic agrifood companies in Central-Southern Italy, this study examines how different food citizenship and governmentality models affect individual responsibility and collective commitment to the Sustainable Development Goals (SDGs). This paper argues that without taking an applied anthropogenic lens to food systems, policies risk producing a "sterilized, distant governmentality" that cannot effectively alter public narratives, even if they are rational and for the common good.	food citizenship; social innovation; rural development; territorial regeneration; governmentality; short food supply chains; responsibility; agency; ethnographic rethinking of sustainability
Responsible and innovation and agriculture	Scopus	Agricultural Systems	2023	Investigating narratives and trends in digital agriculture: A scoping study of social and behavioural science studies	The excitement surrounding how digital agriculture may usher in a new era of agriculture that will be more efficient and productive has translated to public narratives of digitalization as a "silver bullet" to social and environmental challenges. Traditional productivist and techno-optimist perspectives tend not to focus on the socio-ethical considerations and actual application of the innovation, contributing to low adoption rates and irresponsible innovations. This scoping study pays particular attention to stakeholder engagement in social science literature on digital agriculture, finding that integrating more inclusive approaches to technology design and implementation (upstream and bottom-up rather than downstream and top-down) will help mitigate the negative effects of 'disruptive' innovations.	Digital technology, Digital agriculture, Engagement, Social science, Inclusion

Figure 4. Sample excerpt of the literature review conducted for the "responsible innovation" annotated bibliography.

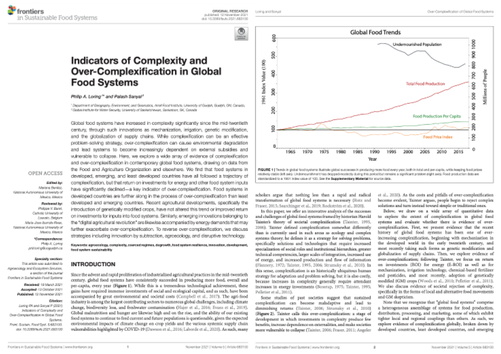

Figure 5. An article reviewed for the annotated bibliography.

CONCLUSION

Achieving a universal definition of "responsible innovation" might not only be an unattainable objective but would also deter efforts to and focus away from actual applications of responsible innovation. To alter agri-food systems to emphasize workers' rights, food availability, environmental sustainability, and economic equity, innovations must be considered holistic systems with varying degrees of contextual impact. There can be no "one" pathway to responsible innovation because innovating responsibly must be an active, ever-changing relationship between the literal or metaphysical innovation, the developer, the user, the environment, the various levels of the community, and time. While I believe that responsible innovations can and should be developed in our current culture, it is crucial we pave the way for a paradigm shift in the way we understand timeframes and lifespans so that immediate remedies, long-term sustainability, and their changing interactions are harmonized.

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