

Towards a participatory systems modelling approach to identify drivers of human health outcomes in food system transitions

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Abstract: Complex adaptive socio-ecological systems such as agricultural ecosystems provide a variety of ecosystem services which are important for human health and wellbeing, for example, food production, biodiversity, cultural and social benefits, and disease regulation. Since the industrial revolution, innovation in agriculture and agricultural production has grown alongside human population growth, allowing human societies to thrive. However, this has come at a cost to the health of the environment and the planet. For example, conversion of natural habitats into agricultural land results in loss of biodiversity, degradation of soils and freshwater, air pollution, and disrupts ecosystem service provision. The focus, therefore, is how we can transition to resilient and environmentally sustainable agricultural ecosystems that balance human, animal, plant and ecosystem health.

According to the Food and Agriculture Organization, an environmentally sustainable and resilient agricultural ecosystem ensures food security and nutrition for current and future generations by maintaining economic profitability, providing benefits for society including poor and marginalised populations with minimal or even positive impact on the environment. Transitioning to environmentally sustainable and resilient food systems offers multiple benefits for human health and wellbeing; however, the impacts of these transitions such as increased irrigation and livestock production can drive the emergence and spread of various infectious disease. Additionally, compounding risks from climate change impacts will also affect food systems and the supply chain, leading to increased risks of food-borne illnesses. With the global population projected to reach over 10 billion by the end of the century, the concern is how we can sustainability transition to resilient socio- ecological agricultural systems that ensure food security and protect environmental and human health in the context of other global drivers of change such as climate change.

In recent decades the theoretical and empirical evidence for the interlinkages between human health and wellbeing, ecosystem services and agriculture has grown, generating several interdisciplinary fields such as ecosystem health, global health, eco health, one health and more recently planetary health. However, there is still a lack of coherent frameworks for operationalising research that (1) link the health of the environment and the health of human beings, (2) identify drivers of change across agricultural ecosystems that lead to different health outcomes, and (3) identify opportunities and pathways for facilitating sustainable and healthy food systems transitions in the context of climate change.

In this presentation, I will draw on complex systems theory and planetary health principles to unpack the relationships between people, the environment, animals and ecosystem services in food systems transition paradigms. I conceptualise these relationships using systems thinking to identify key drivers of ecosystem change that lead to various health outcomes and feedbacks in these relationships. Finally, I propose a transdisciplinary framework and a participatory systems modelling approach to identify drivers of human health outcomes in food system transition paradigms and sustainable food system transition pathways that offer win-win solutions that protect human health and the health of the environment.

Keywords: *Complex socio-ecological systems, participatory systems modelling, food systems transitions, human health, planetary health*