

Living Labs for Sustainable Food System Transformation: Insights from Four Countries

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Introduction

There is an urgent need to support food system transformation given the interrelated crises of climate change, biodiversity loss, hunger, malnutrition and poverty. Given the centrality of social, environmental and economic shortcomings of the current global food system, participatory local solutions need to be both context-specific and relevant across scale. Living Labs are an intermediary approach to link international knowledge exchange with locally led innovation. This paper highlights the development and lessons of such an approach across four countries. Specifically, we ask:

- (1) What were the living lab approaches adopted in each of the four countries for food system transformation and why?
- (2) What was the innovation strategy in each country and how did it tailor to the demands and preferences of local conditions?

This paper is based on a three-year project that facilitated the development of agroecosystem living labs in China, Colombia, Kenya and Vietnam. The explicit aim of the living labs was to contribute towards mitigation efforts in the local and regional food systems while also delivering other social, environmental and economic co-benefits which are necessary for broader food system transformation. The paper draws on extensive planning activities in each of the four countries, including stakeholder mapping, participatory action research and piloting innovations, as well as interviews with project leaders and reviewing the literature on living labs.

Context matters: Diversity across four countries

- **China:** Qingshan Village is a 'Future Village' where adaptive local governance has helped to make the region more sustainable while also attracting investment for local green development.
- **Colombia:** Caquetá Department on the Amazonian frontier has a history of armed conflict and deforestation, but also an emerging network of cooperatives focusing on sustainable cacao and livestock production.
- **Kenya:** Nandi County is one of the country's most productive regional food systems. By working with the county government, the living lab promotes sustainable innovations across the food system.
- **Vietnam:** In the Mekong Delta, the living lab integrates local food system actors to innovate for more efficient and equitable rice-shrimp and mangrove-shrimp production systems.



Figure 1 : Map of the Four Countries

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If you look for local innovations, you will find them: Exciting next steps for the Living Lab for People in Nandi County

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The Living Lab for People has taken significant strides towards becoming a hub for locally led adaptation innovations in Nandi County as the Nandi County government and Kaimosi Agricultural Training Centre hosted the first International Livestock Research Institute (ILRI) pilot.

Living Lab for People is defined as a space for citizens to co-design innovations in real-world settings. In 2024, the Living Lab for People board issued the first call for innovation cases through social media and the extension system.

The idea was to capture a broad range of ideas and then screen for the most innovative ones aligned with the aim of low-emission food system development.

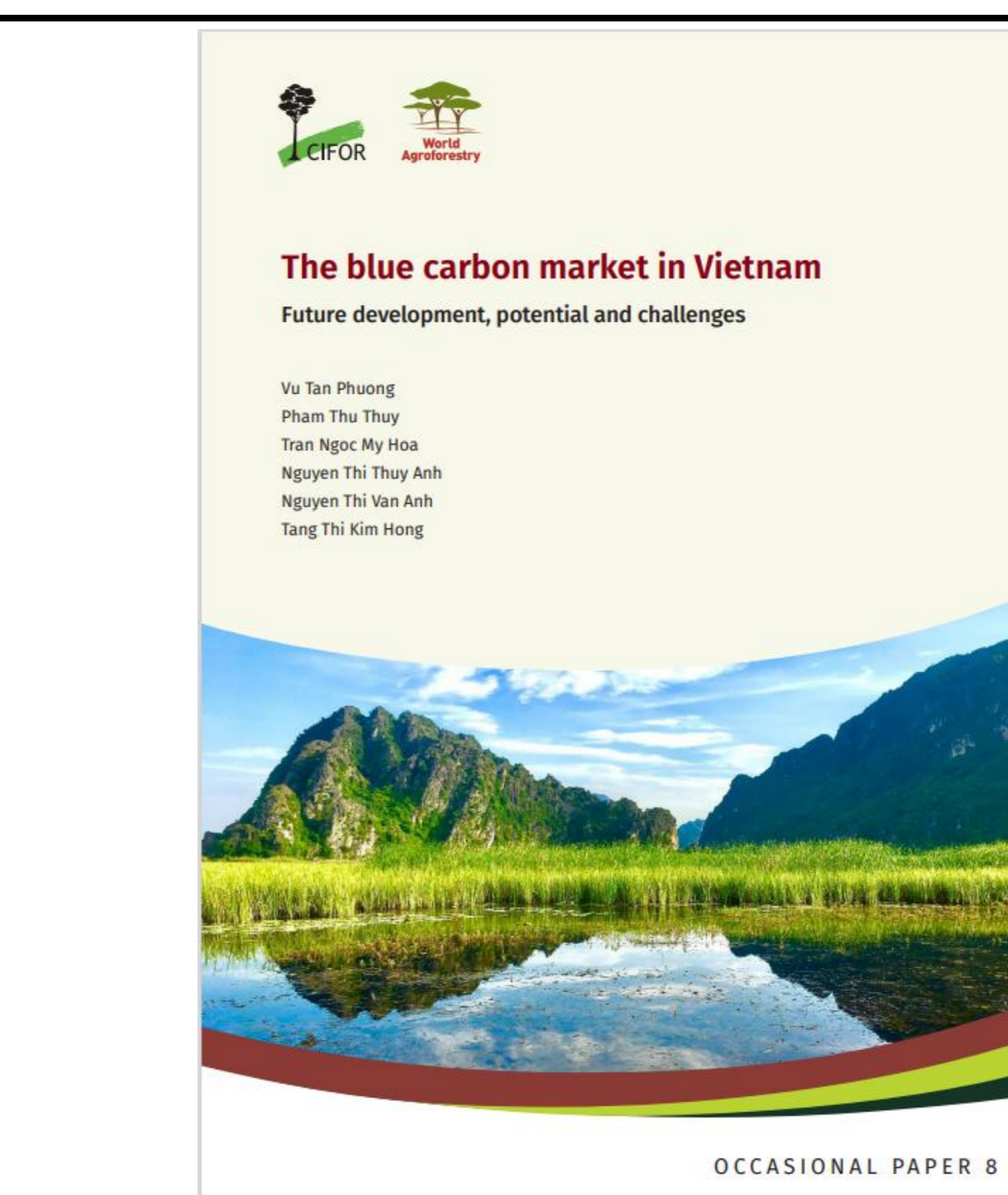
Assessment and evaluation of the submissions to the call was done by the Living Lab for People advisory board, composed of different experts from Nandi County.

Key evaluation criteria included:

- Availability of a detailed description of the proposed innovation.
- Consideration of gender and social inclusion.
- Mitigation potential: Assessing the innovation's ability to reduce emissions.
- Scalability and sustainability: Evaluating potential for growth and long-term impact.
- Food systems transformation: Contribution to transforming Nandi County's food systems in the long term.

Principles of Living Lab Co-Production

- **Interactive:** Which actors are part of and/or affected by the co-production interactive process? It is not just interaction, but who is interacting and why?
- **Goal-oriented:** Who is making decisions to determining goals and for whom do those goals serve?
- **Context-based:** Not all places are the same, and they should be treated as such. What types of governance arrangements are in a given context? Who is over- or under-represented in those contexts?
- **Pluralistic:** Knowledge systems are not all compatible, nor are they equally represented or respected in different contexts. Which knowledge systems can help ensure justice-oriented co-production?
- **Flexibility:** The knowledge creation process is constantly changing depending on who is involved and how the outcomes shape existing interactions. How can living labs be flexible to these changes over time?



A framework for cost-effectiveness analysis of greenhouse gas mitigation measures in dairy industry with an application to dairy farms in China

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Abstract

The dairy industry is a significant contributor to global greenhouse gas emissions (GHG). Although much effort has been directed to explore the cost-effective measures for many sectors such as electricity, building infrastructure, transportation, research on mitigation measures within dairy industry remains limited. A notable obstacle is the absence of a cost-effectiveness analysis (CEA) framework to guide decision-makers and practitioners in this sector. In response, we propose a comprehensive CEA framework tailored to mitigate GHG emissions in the dairy industry. Our conceptual framework consists of six steps: defining the system boundary to determine the activities generating GHG emissions; identifying GHG emission sources within the system boundary; identifying potential mitigation measures; determining methods to quantify GHG emissions; collecting data to estimate both GHG emissions and mitigation costs; and applying general economic methodologies to analyze the cost-effectiveness of mitigation measures. We further conducted a case study focusing on dairy farms in China, analyzing three categories of mitigation measures: feed, energy, and manure management. The results indicate that implementing effective feed and energy measures is a cost-saving strategy, reducing the cost per unit of milk production. Conversely, adopting effective manure management measures may lead to increased costs for dairy farms. The findings offer strategic recommendations for reducing GHG emissions from dairy production in China and provide analytical insights and strategic references applicable to other developing countries.

Keywords: Climate change; Cost-effectiveness analysis; dairy industry; mitigation measures.

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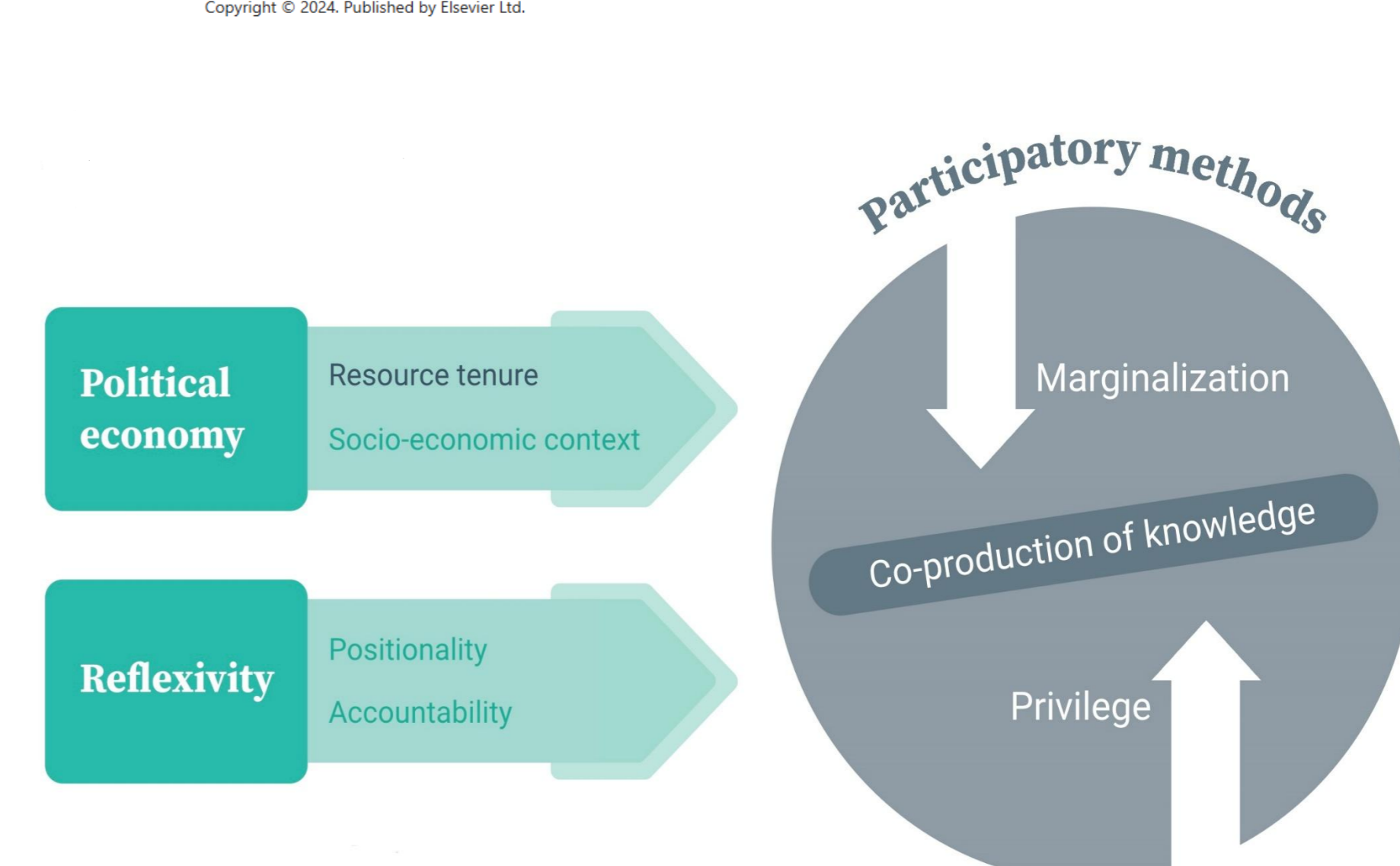


Figure 2: An Approach to Co-producing Knowledge (Source: Nehring et al., 2025)

Gender equality and social inclusion: the living labs strive for a gender/intersectional transformative approach, which aims to dismantle normative and structural barriers to gender equality and other marginalized groups. In its stakeholder engagement processes all the living labs ensure meaningful inclusion and participation of both the more dominant and the more marginal social groups.

Governance and institutional sustainability: an implicit aim of the four living labs is strategic and demand-led support of participating stakeholders. Therefore, both governance structures and principles adhere to what is needed for the living labs in all four countries to achieve sustainability in its specific socio-ecological context. This can include strategizing and collaborating on long-term financing among different partners, applying analytical tools for participatory innovation processes, science-policy dialogues, and institutional partnerships – ultimately the needs are defined by the actors involved in the living labs themselves. Those governance structures however need to be aligned with principles of social inclusiveness and gender equality, as highlighted above. We found that political and cultural factors were central to shaping different country's approaches to implementing living labs. For example, China and Vietnam designed living labs more around existing policy opportunities whereas Kenya and Colombia focused more on particular geographical contexts where living labs could most effectively contribute locally led innovations to improve lives and transform food systems.

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