Independent Science for Development Council

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# Transformation through Inclusive Innovation – Consultation Draft

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*Credit N. Palmer, The Alliance*

# Contents



### About the Independent Science for Development Council

The Independent Science for Development Council (ISDC) is a standing panel of impartial, world-class scientific experts who provide rigorous, independent strategic advice to the CGIAR System Council and other stakeholders. Membership was established in October 2019 and 2022 membership consisted of Holger Meinke (chair), Nompumelelo H. Obokoh (vice chair), Fetien Abay Abera, Andrew Ash, Chris Barrett, Magali Garcia, Suneetha Kadiyala, and Lesley Torrance. In order to operate, ISDC receives operational support from its secretariat, which is part of CGIAR's Independent Advisory and Evaluation Service (IAES) and hosted at the Rome, Italy, office of the Alliance of Bioversity International and the International Tropical Agricultural Research Center.

### Acknowledgments

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# 1. A CGIAR inclusivity transition: Call to action

Transformative innovation in agri-food systems is a global need that motivates CGIAR's 2030 Research and Innovation Strategy. Within CGIAR and beyond, many voices call for more inclusive approaches that recognize the complexity and context specificity of agri-food systems and the insufficiency of supply-driven innovation models. This Note explores the context and current approaches for inclusive innovation (sections 3 and 4) and recommends strategies for a CGIAR inclusivity transition (sections 5 through 8).

Recognizing the rapidly evolving environment for its work, CGIAR seeks to achieve transformative impact through science-based co-development within innovation systems involving diverse partners, networks, assets, and institutions (CGIAR, 2021a). If inclusivity is indeed essential to achieving systems transformation, then it must become a central CGIAR tenet that is embedded into its organizational culture, core functions, and practice from the institutional to the project level.

A deepened capacity for inclusivity can expand CGIAR's sources of comparative advantage in high-risk, long-horizon research that fuels agri-food systems innovation. As crises amplify and trade-offs deepen, robust institutional capacity for co-innovation can enrich CGIAR's collaboration with partners who bring hard-won knowledge and experience in enduring agri-food system shocks. Such partnerships can propel more inclusive innovation, thus **increasing the relevance and legitimacy** of CGIAR research and making more effective use of CGIAR assets by **enhancing the scientific credibility and effectiveness** of potential solutions.

With this Note, the Independent Science for Development Council (ISDC) seeks to stimulate novel, thoughtful action by CGIAR leaders and researchers that embeds inclusive practices and behaviors in agri-food systems research. Based on a literature review and expert consultations, ISDC finds that concepts and practices of inclusive innovation are emergent and recommends that CGIAR pursue an inclusivity transition in a **learning-while-doing** mode.

ISDC encourages CGIAR leadership to create a roadmap for increasing inclusivity across several arenas, including navigating trade-offs, pursuing inclusive and effective partnerships, embracing institutional change, and measuring and learning (sections 5 through 8). To strengthen CGIAR's delivery of results in its five defined impact areas, ISDC advises applying the following general approach:

⇒ **Disrupt and rebuild.** Start right now to disrupt those assumptions that inhibit authentic participatory engagement. Then, rebuild by crafting new narratives that recognize and integrate stakeholder diversity and dynamism (section 5). By examining and defining its comparative advantage in demand-led integrative and transdisciplinary research, CGIAR can attract a broader range of experts to its research partnerships. More systematic assessment of inclusivity within current partnerships can reveal new collaboration strategies that invigorate transformative, equitable innovation (section 6).

⇒ **Test and measure.** Test institutional reforms that promote reflexivity and inclusive models for research teams and projects, grounded in well-informed theories of change. CGIAR can experiment with new incentive structures that steer researchers toward analysis and communication of agri-food system trade-offs and encourage trust-based co-innovation that balances multiple stakeholder objectives (section 7). Over time, CGIAR's results measurement system can more fully embody a holistic, complexity-aware approach to assessing CGIAR's contributions to transformative innovation, including local innovation systems that have better-functioning networks, more robust infrastructure, and more empowered participants (section 8).

⇒ **Invest and deliver.** Bolster CGIAR's ability to dynamically invest based on measured results for how to better reach those who are being left behind in current and future agri-food system transitions. To deliver transformative impact in partnership with host governments and other agri-food system actors, CGIAR can model inclusive co-creation through pooled funding and adaptive programming (section 7).

Agri-food systems need transformative innovation, but ISDC is not recommending that the System Council promote a sea change in how CGIAR operates that would undermine current delivery based on its existing strengths. Rather, ISDC recommends **incremental innovation within CGIAR institutional processes and partnerships** to more effectively underpin CGIAR's contribution to **transformative innovation of food, land, and water systems in a climate crisis**.

# 2. Approach

Mandated to provide independent strategic science for development advice to the CGIAR System Council, ISDC published a 2021 discussion brief, Incubating Innovation: A One CGIAR Culture and Mindset, that highlighted opportunities to boost inclusivity through internal capacity building, strategic engagement in partnership networks, and results-based investment.[1] Building on this earlier work, this Note explores at a deeper level the significance of inclusive innovation for CGIAR's progress in the five impact areas outlined in the 2030 Research and Innovation Strategy (CGIAR, 2021a) and for its comparative advantage within the global innovation ecosystem. Given growing expectations among key stakeholders for CGIAR to embrace more fully inclusive mindsets and practices (Soanes et al., 2021), ISDC sees a near-term opportunity to enhance the relevance, scientific credibility, legitimacy, and effectiveness of CGIAR-engaged research by more systematically integrating diverse stakeholder knowledge, insights, and leadership.

This Note is motivated by the potential of inclusive models to generate context-specific innovation under increasing agri-food system volatility and crisis and to make more effective use of CGIAR assets (e.g., extensive in-region networks, close contact with local stakeholders, scientific expertise and facilities). It characterizes features of the existing innovation systems and provides guidance on how to move toward more inclusive innovation systems. It also highlights validated strategies for navigating trade-offs, advancing inclusivity through partnerships, fostering mindset and behavioral shifts through institutional changes, and undertaking related measurement and learning. For each of these, the Note sets out a **reflection toward action** to stimulate new thinking and action among decision-makers.

The Note reflects structured compilation, objective review, and synthesis of recent literature relevant to inclusive innovation with emphasis on nutrition, poverty, gender, climate, and environment. Sources include (1) literature previously compiled by ISDC; (2) documentation of existing and ongoing work within CGIAR; (3) publications and other resources identified through expert consultations; and (4) internet searches for articles in peer-reviewed and popular journals as well as recent publications, including gray literature, by selected research-for-development institutions and CGIAR partner organizations. Expert consultations provided insight regarding the range of inclusive innovation concepts and practices among a discrete set of CGIAR researchers and partners (Annex 1). The final Note will also be informed by a TropAg symposium and session discussions in November 2022.

# 3. Rationale for an inclusive innovation culture in CGIAR

## *3.1 Context*

Agri-food systems are diverse, dynamic, complex, and interconnected and face significant disruptions (ISDC, 2021), and agri-food systems research is wide ranging (CGIAR, 2021b; Dalberg Asia, 2021). There is much we do not yet understand about how agri-food systems function, and the relationship between research and agri-food system innovation is a topic of ongoing scientific exploration (ISDC, 2020a). ISDC previously recommended that CGIAR agri-food systems research be enhanced to complement its well-developed capabilities related to farm-level production, sustainable resource management, and agrobiodiversity conservation (ISDC, 2020a).

There is broad agreement on the need for transformation of agri-food systems to meet global sustainability goals (Conti et al., 2021; Läderach et al., 2021) and the importance of research and innovation to this agenda (Campos, 2021; USAID, 2021). To bring households out of poverty and improve food and nutrition security for all, hundreds of millions of smallholder farmers need to improve their agricultural productivity and livelihoods (Nelson, 2019). Yet, across highly diverse stakeholders, agreement is elusive regarding how food should be produced, processed, transported, sold, and consumed in the agri-food systems of the future (Anderson & Maughn, 2021). Notably, agri-food systems may resist change given prevailing individual, institutional, and sectoral attitudes and embedded technologies, infrastructure, policies, and research priorities (Conti et al., 2021).

## *3.2 Agri-food systems research: decades of evolution*

Over the last three-quarters of a century, the scope of global agri-food systems research has expanded from a predominant focus on technology-based yield enhancement to a diversified palette of research efforts that encompasses multi-objective systems approaches to innovation (Cock et al., 2022). The journey from reductionist toward more inclusive, holistic approaches is ongoing. In low- and middle-income countries, the US$60 billion invested annually in agricultural research heavily emphasizes technology development and dissemination for production of commodity crops, primarily cereals, with

[1] In line with its mandate, ISDC recommendations emphasize actions that can be taken through CGIAR's formal institutional mechanisms, while also recognizing the role of informal and semi-formal partners in innovation systems.

less than one-third allocated to innovation in infrastructure, institutions, policies, and incentives (Dalberg Asia, 2021). Yield-focused research, which has dominated the stage for public and philanthropic investments in international agricultural development since the Green Revolution, is ongoing within CGIAR and beyond. In parallel, research funders have continuously and energetically added new themes and pilots (Douthwaite & Hoffecker, 2017; Johnson et al., 2019). For instance, in recent decades agricultural research programs have increasingly included natural resources management and ecosystems services (ISPC, 2012; Stevenson & Vlek, 2018). Similarly, market-based development approaches have stimulated research related to smallholder integration and risk management in agricultural value chains (Nelson, 2019).

**CGIAR: an expanding research scope.** The impressive achievements of the Green Revolution delivered much-needed food calories to millions of people, but subsequent decades have revealed the limitations of steering singular technologies into complex local agri-food systems across the world. Over its 50-year history, the CGIAR research portfolio has evolved from a primary emphasis on production technologies (e.g., improved seeds and farm practices for staple crops) to a more expansive portfolio that today encompasses environmental sustainability (e.g., fertilizer micro-dosing, pest biocontrol), rural resilience (e.g., climate-smart villages, holistic watershed development, insurance), nutrition (e.g., agrobiodiversity, kitchen gardens), social and institutional change (e.g., empowerment of women and youth, inclusion of indigenous knowledge, land tenure, pro-poor policies), and climate mitigation (e.g., emissions-tracking methodologies) (CGIAR, 2021b). Since the advent of the CGIAR Research Programs, partnerships have grown in importance both for designing and conducting research and for scaling up research outputs (CGIAR-IEA, 2017).

The impact of a half-century of CGIAR research has been significant, particularly related to increased yields of staple food crops (Alston et al., 2020). Yet there is also evidence that some research outputs have led to negative agri-food system outcomes. Prevalent critiques include the following:

- Research outputs have contributed to negative social and environmental externalities such as diminished health (e.g., diet-related disease), livelihoods (e.g., working conditions, income), and environmental quality (Barrett et al., 2022; van Etten, 2022).
- Linear, supply-driven research approaches are ill suited to complex agri-food systems and transformational innovation (Hall & Dijkman, 2019); rather, demand-driven, context-specific approaches result in more effective integration of agricultural technologies and agri-food system interventions (Acevedo et al., 2020; Eriksen et al., 2021; Makate et al., 2019).
- Scaling strategies for research outputs are poorly aligned with real-world adoption, capacities, and innovation processes (Shilomboleni et al., 2019; Stevenson & Vlek, 2018), which require supporting institutions, infrastructure, policies, and market interventions (Aerni et al., 2015) and a focus on the functional capacities of sectoral actors (Toillier et al., 2020).
- Many research diffusion models result in unequal access and benefits when they ignore social determinants, farm-level trade-offs, and local innovation networks (Acevedo et al., 2020; Evenson & Gollin, 2003; Foster & Heeks, 2013).
- Research impact pathways often overemphasize value chain approaches and private sector research despite weak evidence of actual impacts (Barrett et al., 2022; Evenson & Gollin, 2003) and questionable viability of smallholder livelihoods (Cock et al., 2022; Giller et al., 2021; Nelson, 2019).
- Monitoring, evaluation, and learning (MEL) have been underutilized by research programs and public, private, and philanthropic decision-makers (Brooks et al., 2019; Hall & Dijkman, 2019; Lipper et al., 2020).

**Existing innovation environment**. CGIAR has been widely recognized for its contribution to scientific and technological advances in agriculture. Yet CGIAR-led research has been criticized for insufficient investment in understanding and managing social and environmental externalities, for unequal access to and benefits from research outputs, overemphasis on value chain approaches and supply-driven scaling pathways, and insufficient attention to measurement and evaluation.

### *3.3 Inclusive innovation in agri-food systems: emergent concepts and practices*

Currently, heterogeneous concepts and practices of inclusive innovation are being deployed within dynamic agri-food system processes that operate at many scales (see Annex 1). Proponents of various frameworks draw upon a range of underlying worldviews. Mausch et al. (2020) describe the complex, multi-level, "interconnected web of activities, resources, and people that extends across all domains involved in providing nourishment and sustaining health" that comprise an **agri-food system**, with multiple feedback mechanisms responding to social, cultural, political, economic, health, and environmental conditions.

As a widely used term, **innovation** has many definitions. The World Bank (2012) refers to "an invention that is used for the first time in a product that reaches the market or produces a change in a social process." **Agricultural innovation** can be defined as "the process of creating and putting into use agricultural practices, new to a particular environment" and can occur at different scales (Gildemacher & Wongtschowski, 2015).

In its 2030 Research and Innovation Strategy (2021a), CGIAR defines innovations as "new ideas, products, services, and solutions capable of facilitating impact through innovation systems involving multiple partners and enablers" introduced and scaled by an "interlinked set of people, processes, assets, and social institutions." **System transformation** is described as a major shift in system governance and functioning, requiring goal-driven action by multiple stakeholders, that results in significant, positive change for the majority of people involved.

Saragih and Tan (2018) define **co-innovation** as collaboration, coordination, co-creation, convergence, and complementarity that generates "innovative and exceptional design conducted by various actors from firms, customers, and collaborating partners," resulting in a new business model, customer base, customer value, value chain, or products and services. A basic definition of **inclusive innovation**, put forward by Heeks et al. (2013), refers to "the means by which new goods and services are developed for and/or by those who have been excluded from the development mainstream; particularly the billions living on lowest incomes." The International Finance Corporation defines an **inclusive business model** as "a business that provides goods, services, and livelihoods on a commercially viable basis, either at scale or scalable, to people living at the base of the economic pyramid, making them part of the value chain of companies' core business as suppliers, distributors, retailers or customers" (IEG, 2018).

An **innovation system** has been described as the complex, decentralized, and emergent flow of resources (e.g., finance, materials, labor) and knowledge (i.e., formal and informal) across many stakeholder groups and networks (Hall & Clark, 2010). Hall & Dijkman (2019) discuss the types of innovation environments that promote: (1) **incremental innovation,** which refers to optimization within an existing system and innovation trajectory; (2) **incumbent innovation,** in which a production and consumption system transforms based on an economic growth imperative; (3) **experimental discontinuity,** in which numerous niche innovations disrupt the prevailing innovation trajectory; and (4) **sustainability transitions,** in which values, incentives, and regulations stimulate a discontinuous shift in production and consumption innovation.

Recognizing the limitations of earlier approaches to agri-food systems research and innovation, a number of alternative frameworks have been conceived, developed, and tested that emphasize inclusivity, diversity, and empowerment of marginalized groups as central to effective innovation in complex, evolving, and highly disrupted agri-food systems. Some common frameworks (used separately and in tandem) include the following:

- Agriculture innovation systems (AISs) are defined as "complex networks of actors (individuals, organizations and enterprises), together with supporting institutions and policies, that bring existing or new agricultural products, processes, and practices into social and economic use" (TAP, 2016). Deviating from linear, top-down approaches, self-organizing AISs emerge as different actors interact and pursue their own strategies in response to technological, institutional, or organizational opportunities and constraints (Gildemacher & Wongtschowski, 2015; Spielman et al., 2009; Sulaiman, 2015).
- Socio-technical innovation bundles combine locally and globally scaled practices to achieve efficiency of scale, navigate trade-offs, stimulate institutional reform, mobilize private capital, deploy digital platforms to increase civic engagement, and decentralize power. When these bundles are regionally fit-for-purpose and effectively integrate local stakeholders, they may supplant prevailing socio-technical regimes (Barrett et al., 2022; Keppler, 2019).
- System innovation approaches apply a multi-level perspective and employ societal experimentation and cyclical transition management to the introduction of sustainable technologies. This framing accounts for path dependencies and emphasizes the direction of innovation activity and dynamic sustainability transitions toward reconfigured social, political, technical, institutional, and policy conditions (Hall & Dijkman. 2019).
- The Participatory Market Chain Approach (PMCA) focuses on commercial innovation as a strategic entry point for stimulating more systemic (i.e., commercial, technical, and institutional) innovation, emphasizing the engagement of market entrepreneurs and influential individuals in government and the development community (Horton et al., 2022). To increase participation in agricultural markets by extremely poor smallholder farmers (and thus boost their income, food security, and resilience), inclusive market systems development (iMSD) addresses institutional, cultural, and power dimensions affecting access to credit, services, and markets (Tumusiime et al., 2022).

- Multi-stakeholder platforms (MSPs) and innovation platforms (IPs) function as "intermediaries that connect the different actors[2] in innovation systems in order to foster effective co-evolution" and dynamically resolve interactional tensions at actor interfaces (Kilelu et al., 2013). MSPs address power imbalances and barriers to inclusion (Ratner et al., 2022), and innovation is not restricted to technological advances (Glennie et al., 2020). Scaling can be enhanced through linkages to the larger institutional context (Seifu et al., 2020; Totin et al., 2020).
- Farmer research networks (FRNs) encompass (1) self-organization and trust relationships; (2) iterative capacity development for agri-food system research; (3) knowledge-sharing, exchanging, and social learning; and (4) bridging, improving, and bonding of social capital. FRNs seek to elevate farmers as true partners in research and can be effective in policy advocacy (Nicklin, 2020; Richardson et al., 2021).
- Participatory Innovation Development (PID) processes combine different sources of knowledge through joint experimentation among researchers, farmers, and other members of rural communities in order to empower farmers to solve their problems using locally available resources (Waters-Bayer et al., 2020).

A review of recent evidence suggests that in practice inclusive innovation is reflects a few main themes, including affordability of products and services, local entrepreneurship, capacity building, social empowerment, and system-level change (Mortazavi et al., 2021). Assessment of mature innovation platforms finds the most promising results where facilitation and stakeholder representation are strong and when IPs are "firmly embedded in other public and private extension mechanisms and networks" (Schut et al., 2018).

**Frameworks for more inclusive innovation**. To steer toward more inclusive innovation models and account for the complexity and dynamism of agri-food systems, alternative frameworks have been developed in recent decades. These frameworks variously emphasize improved characterization of local contexts and trade-offs, multi-level engagement with a broader set of agri-food system actors, bundled technologies, value chain entrepreneurship, functional capacity development, empowerment of farming communities, novel modes of knowledge exchange and emergent collaboration, and system-level sustainability transitions.

# 4. Building an inclusive innovation culture

### *4.1 Innovation in a contested space*

At this moment in history, research priorities for agri-food systems are hotly contested, fueled by divergent narratives about how science can and should influence agri-food systems (van Etten, 2022). The world's agricultural markets have shifted from relative stability and downward price trends to volatility and dramatic price spikes, which are associated with civil unrest in some areas and cropland expansion in others (Cassman & Grassini, 2020.)

Given the world’s inadequate progress toward global goals for sustainability and equity (Conti et al., 2021), CGIAR faces growing expectations from key stakeholders that it will rapidly integrate inclusivity to increase the relevance, scientific credibility, legitimacy, and effectiveness of its research activities (ISDC, 2020b). Yet among CGIAR's research staff, funders, partners, and other stakeholders and beyond, convergence toward a universal definition or framework of inclusive innovation is nascent (Mortazavi et al., 2021).

### *4.2 Guiding principles and evidence-based strategies*

In this contested and emergent space, CGIAR can pursue a learning-while-doing agenda. In ISDC's view, some inclusive innovation concepts are sufficiently well developed to provide guidance for CGIAR. For example:

- Inclusive innovation is not a product, but a contextualized process that engages local actors (e.g., farmers, small-scale entrepreneurs) as drivers of diverse innovation outcomes.
- Co-innovation is insufficient without explicit and active inclusion of marginalized groups and research approaches in processes and partnerships (e.g., transdisciplinarity).
- Inclusion is intersectional (e.g., gender, age, ethnicity, neurodiversity, disability).

[2] For example, farmers, extension officers, policymakers, researchers, nongovernmental organizations (NGOs), development donors, the private sector, and other stakeholder groups seeking to understand and address agricultural problems by developing and testing innovations (Schut et al., 2018).

- Clear rationales (e.g., more robust impact potential) are needed if CGIAR funders, leaders, and researchers are to adopt new mindsets and practices necessary for an institutional transition that meets stakeholder expectations for inclusive innovation systems.

Depending on their context and structure, mechanisms for inclusive innovation can leverage diverse stakeholder knowledge and insights toward richer analysis of local agri-food challenges and the viability of potential solutions, while increasing stakeholder motivation to engage in coordinated action in response to more clearly defined needs (Schut et al., 2018). ISDC believes that sufficient evidence is available to propose expanded testing and use of strategies for navigating trade-offs, advancing inclusivity through partnerships, fostering mindset and behavioral shifts through institutional changes, and measuring gains in inclusive innovation. These are explored in sections 5 through 8 below.

Importantly, ISDC is not proposing a complete change in how CGIAR operates or an interruption of delivery based on its existing strengths. CGIAR's contributions should continue to emphasize development of international public goods while increasing the relevance, scientific credibility, legitimacy, and effectiveness of its work through deep, equitable collaborations with host governments and other agri-food system actors who lead innovation in diverse local and national contexts. ISDC is encouraging CGIAR leaders to pursue innovation at multiple levels: embracing incremental innovation within CGIAR institutional processes, practices, and partnerships while contributing to transformative innovation within agri-food systems.

# 5. Strategies for navigating trade-offs

Agri-food system actors are continually required to decide whether to give up something of value in order to acquire something else of value. Decision-making is especially difficult when such trade-offs involve multiple actors (e.g., individuals, households, communities, institutions) who will experience different types of costs and benefits over different time scales (Lazos-Chavero et al., 2016).

Trade-offs are ubiquitous throughout agri-food systems. They may be framed as technical optimization of benefits such as soil carbon sequestration and nitrous oxide emissions resulting from nitrogen fertilizer use (Hijbeek et al., 2019). Trade-offs might surface as competing objectives for equitably supporting low-income producers or achieving more rapid environmental benefits through risk management interventions (Johnson et al., 2019; Piñeiro et al., 2020). At a grander scale, a "money-food-environment trade-off" can arise when farmers' incomes, consumer prices, and food product sustainability are in fundamental tension (Mausch et al., 2020). In allocating finite resources across different research priorities (e.g., crop yields, biodiversity conservation, human nutrition), trade-offs among the anticipated agronomic, environmental, and socioeconomic outcomes may emerge (Kanter et al., 2018).

Given increasing demands for agri-food systems to simultaneously deliver nutritious diets, rural prosperity, greenhouse gas reductions, ecosystem services, and conservation of biodiversity in a context of climate change and global population growth, trade-offs in agri-food system innovation cannot be avoided (Antle & Valdivia, 2021; Kanter et al., 2018). In environments where singular technologies are adopted, there will be winners and losers. For example, Herrero et al. (2021) could not identify an emergent agri-food system innovation that did not have both positive and negative impacts. A number of inclusive strategies for navigating such trade-offs have been tested, including:

- Recognize and integrate stakeholder diversity and dynamism (e.g., unique socioeconomic circumstances, shifting contextual factors) into decision-making, and disrupt problematic assumptions underlying research priority setting (Lazos-Chavero et al., 2016; Mausch et al., 2020).
- Improve analysis (through, e.g., context-specific, multi-scale indicators; system-level modeling combined with intervention evaluation or stakeholder-engaged down-scaling), and communicate trade-offs (e.g., winners and losers) (Kanter et al., 2018; Klapwijk et al., 2014; Ker Rault et al., 2019; ISDC, 2021).
- Use mechanisms for transparent, fair, and respectful deliberation and legitimate compromise to increase trust, information flow, and acceptability of trade-off and mitigation options (IPES-Food, 2015; ISDC, 2020b; Lazos-Chavero et al., 2016; Glennie et al., 2020).
- Improve institutional capabilities for navigating trade-offs by developing well-informed theories of change, adaptive programming, and co-created innovation bundles that balance stakeholder objectives and outcomes (Barrett et al., 2022; Mausch et al., 2020).

**Strategies for navigating trade-offs** emphasize integrating stakeholder diversity and dynamism and transparent acknowledgment of winners and losers into trade-off analysis and deliberation, which can be enhanced by combining intervention evaluation with system-level modeling and expanded institutional capabilities.

Combining foresight analysis and simulation modeling, **trade-off analysis** is "a participatory process designed to formulate and evaluate forward-looking, strategic decisions under high levels of uncertainty in complex systems" (Antle & Valdivia, 2021). Resulting insights can support multidimensional decision-making from household to policy levels (Schut et al. 2018).

***Reflection toward action in CGIAR***

*What mechanisms could champion and support regular, participatory trade-off analysis at project and portfolio levels to shed light on the position of losers and the possible mitigating effects of bundling interventions? As independent and internal CGIAR bodies conduct new foresight and horizon scanning, how will they navigate literature gaps in gender, poverty, and nutrition impact areas (Lentz, 2020)? How will CGIAR governance bodies leverage expanded foresight work to inform trade-off analysis when making investment decisions?*

# 6. Strategies for inclusive and effective partnerships

Partnership strategies become increasingly important as research leaders recognize their work must become more complexity-aware and be deeply integrated within wider development and systems change agendas (Tomich et al., 2019). For CGIAR, this includes appropriate entry points for partnering with informal, semi-formal, and formal organizations and across agricultural communities, multi-scale value chains, and public-private research networks, in efforts that complement partnerships with national agricultural research and extension systems (NARES). Partnerships with local actors, explicit engagement of small-scale farmers, and legitimate integration of indigenous knowledge will require special attention.

Within partnerships, CGIAR's comparative advantage will commonly emerge from its ability to function as an integrative platform that facilitates complementary research investments and activities, as well as its capacity to deploy its substantial scientific expertise and in-region facilities toward low-commercial-value / high-social-value, high-risk, long-horizon research that contributes to context-specific agricultural innovation (ISDC, 2022b).

The CGIAR Engagement Framework for Partnerships and Advocacy defines a partnership as "an intentional relationship with private sector, public sector, academia, or civil society organizations, at national, regional, and/or international levels" (CGIAR, 2022). The document presents a typology that proposes 13 types of partners[3] and indicates how they are most likely to engage with CGIAR in developing "innovative evidence-based solutions and technologies." Private farmer and industry associations are anticipated to engage in the conception and design (i.e., "demand"). Farming communities are expected to contribute to implementation, development, and piloting (i.e., "innovation"), as are multi-stakeholder platforms and SME incubators and impact accelerators, which are also listed under the deployment and diffusion (or "scaling") phase. Farming communities are not included in the partner segmentation structure, which is intended to inform "targeted strategies for specific sectors and partnerships, for instance, where CGIAR needs to build its capacities or assign resources to strengthen those of partners."

Partnerships are formed and implemented within dynamic, multi-level contexts. At the global level, for example, funding sources for agricultural research are evolving as investment growth in middle-income countries, like China and India, outpaces spending by wealthy nations (Dehmer et al., 2019) and as expanding private research investment drives technological advances (Dalberg Asia, 2021). At the national to local level, the potential impact of research partnerships will depend on available research and education capacity and other types of soft infrastructure (Cock et al., 2022).

A number of partnership strategies have been put forward for advancing inclusive innovation:

- Assess functioning of network-based partnerships, including knowledge creation and exchange, institutional collaboration, and capacity for local differentiation (Fernandez de Arroyabe et al., 2021; Foster & Heeks, 2013; Nicklin, 2020).

[3] Sample partners include national/subnational governments; funders; global and regional organizations (e.g., UN agencies, African Development Bank); private sector associations (farmers, industry, etc.); NARES; national civil society organizations; international civil society organizations; research organizations and universities; multi-stakeholder platforms; venture capital, equity, and impact funds; SME (small- and medium-sized enterprise) incubators and impact accelerators; regulatory agencies and bodies; and farming communities.

- Assess functioning of public-private partnerships, including how they operate and their influence on innovation systems (e.g., overcoming sectoral disconnects, performance metrics, behavioral change) (Hermans et al., 2019; Osorio-Cortes & Lundy, 2018; Sabet et al., 2017).[4]
- Invest in higher-quality partnerships, including identification, effective facilitation, dedicated support, linkage to broader development efforts, and performance assessment (Horton et al., 2022; Nicklin, 2020; Prain et al., 2020; Seifu et al., 2020).[5]
- Increase duration (e.g., early-stage engagement, beyond short-term project cycles) and scope (e.g., beyond market development or farmer participation in small plot trials) of partnerships to increase the likelihood of innovations scaling beyond a niche level (Hermans et al., 2019; Horton et al., 2022; Nicklin, 2020; Prain et al., 2020; Richardson et al., 2021).

**Effective and inclusive partnership strategies** can steer toward inclusive innovation by increasing the duration, scope, and quality of partner relationships (e.g., early-stage engagement, focus beyond participatory trials, effective facilitation). Such strategies will be informed by more robust assessment of the function and performance of network-based and public-private partnerships.

***Reflection toward action in CGIAR***

*How will partnership practices in One CGIAR test and advance inclusive innovation? Processes of empowerment and consciousness raising, central concepts to an advocacy agenda, require an enabling environment. One CGIAR has taken major strides by setting out its modus operandi for partnerships in the document Toward Greater Impact: A CGIAR Engagement Framework for Partnerships and Advocacy (CGIAR, 2022) and engaging a high-level partnership panel to advise CGIAR's System Board and Executive Management Team. A natural next step would be to incorporate new ways of working that can reach and react to the groups most marginalized in agri-food system decision-making.*

# 7. Strategies for institutional change

In addition to cultivating an inclusive, learning culture that responds to the critiques discussed in section 3, CGIAR has additional rationales for building its institutional capacity for inclusive innovation. Innovation models will be better suited to a context of increasing agri-food system volatility and crisis if they draw upon a large, diverse pool of expertise and experience gained through crisis-driven, survival-oriented innovation (AlMalki & Durugnbo, 2022). When researchers develop greater self-awareness of their personal biases and professional agendas, this reflexivity can minimize power dynamics that inhibit inclusivity (Wong et al., 2019). Gaining capacity for co-innovation can be considered an investment in "up skilling" in anticipation of rapid agri-food system evolution and deepening trade-offs (Fielke et al., 2018).

Given the powerful influence of development narratives on the research investment priorities of CGIAR leaders and funders, it is important to carefully assess underlying sources of evidence in terms of rigor, interdisciplinarity, and accuracy. Such assessment allows for objective consideration of alternative narratives (van Etten, 2022), including those that envision long-term public sector leadership (Nelson, 2019) and encompass social and political transformation and a shift away from incumbent innovation models (Conti et al., 2021). Yet agricultural research institutions have only sparingly engaged in institutional experimentation, owing in part to short project cycles and concerns about politicization, which limit potential progress in developing inclusive innovation modalities (Schut et al., 2018). Experimentation may be further inhibited by the sheer complexity of most institutional arrangements and governance of agri-food systems.

CGIAR can demonstrate global leadership in inclusive innovation that prioritizes transparency, fairness, and respect by embracing institutional change strategies such as the following:

- Promote reflexivity among researchers to encourage authentic participatory interaction with agri-food system actors (De Leener, 2003; Fielke et al., 2018; Waters-Bayer et al., 2020).

[4] At their outset, public-private partnerships will ideally be based on clear-eyed assessment of what is required to achieve sustained, equitable benefits as well as the actual latent demand for commercially delivered inputs and services and the cost-effectiveness of any required public or philanthropic subsidy (Johnson et al., 2019; Nelson, 2019).

[5] Partnerships attempt to integrate contributors' diverse objectives and assumptions. However, partnerships can generate mutual misunderstanding if incompatible objectives are obscured by overly optimistic projections embedded within project proposals (Johnson et al., 2019; Schillo & Kinder, 2017).

- Foster inclusive models for research projects and teams that embrace transdisciplinarity at all stages, explore new governance concepts (e.g., holacracy, multirationality), and allocate resources for staff skill building (Nchanji et al., 2022; Schreiber et al., 2022; Waters-Bayer et al., 2020).
- Craft CGIAR narratives that describe how its comparative advantage depends upon inclusive innovation modes within complex, multi-level agri-food systems (e.g., reducing power imbalances) (Botha et al., 2017; Glennie et al., 2020; Hall & Dijkman, 2019; ISDC, 2022b).
- Test institutional reforms related to inclusive innovation such as new researcher incentives (e.g., that promote reflexivity and contextual solutions), adaptive programming, policy alignment, and longer-term research funding cycles (i.e., to support in-region partnership development, trade-off analysis, and collaborative research) (Fielke et al., 2018; Foster & Heeks, 2013; Shilomboleni et al., 2019; Waters-Bayer et al., 2020).

**Institutional changes** can encourage mindset and behavioral shifts that enable inclusive innovation by promoting self-reflexive analysis and skill building among researchers and by setting expectations for participatory modes within multidisciplinary research teams. Through structured experimentation with inclusive innovation modes and new institutional narratives, CGIAR can play a leadership role in inclusive, science-based agri-food system transformation

***Reflection toward action in CGIAR***

*How can One CGIAR incubate and accelerate inclusive innovation? Across CGIAR and its partnership network, a growing community is deepening its understanding of and capacity for inclusivity within its institutional culture, research for development practice, and innovation systems. What mechanisms could champion and support this learning community as its members elaborate and test ideas and curate knowledge?*

# 8. Strategies for measurement and learning

**Measurement challenges are perennial,** and it is not possible to measure everything. Meta-analyses that seek to inform research and policy agendas encounter important gaps in available evidence given the broad range of intervention types and outcomes in agri-food systems (Bernstein et al., 2019). Foresight analyses commonly focus on technological innovation and give sparse attention to adoption pathways, policy innovation, poverty reduction, and social inclusion (ISDC, 2020a). Divergent perceptions about the relevance and usefulness of measurement tools can inhibit consistent use and accuracy by in-region teams (Agrinatura & FAO, 2019).

Rigorous impact evaluations of value chain initiatives and of the role of the private sector in agri-food system innovation are rare (Mausch et al., 2020). Despite their prevalence, public-private partnerships are not comprehensively mapped or assessed, although there is some evidence that they produce weak environmental and social benefits and are unlikely to overcome underlying drivers of smallholder poverty, exclusion, and vulnerability (Nelson, 2019; IEG, 2018.) Assumptions of the enhanced efficiency or effectiveness of commercially oriented agricultural research projects are not well substantiated, especially when intended beneficiaries are highly vulnerable (Johnson et al., 2019). Agricultural research organizations have demonstrated low enthusiasm for learning from failure (Schut et al., 2018).

While increasing rigor and scope have been noted in CGIAR's monitoring, evaluation, and learning (MEL) practices, recent work has also identified gaps that inhibit inclusivity. Weak collection of gender-disaggregated data and other barriers restrict systematic assessment of synergies, trade-offs, and socioeconomic heterogeneity (SPIA, 2019). Recognizing the slow pace of progress toward rigorous impact measurement of integrated systems research, a recent CGIAR workshop took stock of barriers (e.g., limited staff capacity for using theories of change) and opportunities (e.g., increased use of geospatial data and qualitative methods) and proposed changes to internal systems and collaboration with research funders (Johnson, 2021).

Measurement approaches continue to evolve. For example, open-access digital tools and standard methods have been developed to promote consistent benchmarking and performance assessments for benefits from context-specific innovation in aquaculture systems (Rossignoli et al., 2021). Recognizing that capacity development projects are implemented quite differently across agri-food system contexts, Toillier et al. (2020) have developed a qualitative and mixed-method monitoring and evaluation approach for agricultural innovation systems.

**Institutional criteria increasingly align with inclusive approaches to innovation.** The CGIAR Evaluation Policy (2022) specifies the following criteria: relevance (e.g., responsiveness to partners' needs), effectiveness (i.e., in achieving objectives), coherence (e.g., regional or sectoral compatibility), efficiency (e.g., economical, timely delivery), quality of science (e.g., credibility, legitimacy), sustainability (e.g., continuity of benefits), and impact (i.e., higher-level effects) (CAS, 2022). In reviewing proposals for CGIAR initiatives, the ISDC applied criteria related to, among other things, demand-driven co-design, equitable partnerships, social inclusion, transdisciplinarity, and empowerment of underrepresented stakeholders (ISDC, 2022a). The Global Forum on Agricultural Research and Innovation (GFAR) has proposed criteria for assessing the quality of research partnerships that encompass participatory objective-setting, negotiation of shared responsibilities, mutual learning, equitable benefit sharing and acknowledgment, broad dissemination of results, flexibility to local contexts, and other features of inclusive innovation partnerships (Meschinelli et al., 2022).

Information produced by comprehensive MEL systems should help decision-makers to learn what is working and what is not working. Based on these insights, decision-makers can develop empirically based theories of change that are suitable to the nonlinear impacts arising from beneficial interactions among heterogeneous actors in complex innovation systems (Douthwaite & Hoffecker, 2017). MEL information can include cost-effective, timely trade-off analysis built around plausible assumptions and potential outcomes (Antle & Valdivia, 2021). Schut et al. (2018) distinguish between content (e.g., improved practices and technologies) and process (e.g., increased collaboration, stronger networks) impacts. To overcome "inequitable terms of engagement with 'vulnerable' populations" and to increase their transformational potential, research programs should integrate global contexts and drivers of vulnerability into their design and emphasize shared ownership of knowledge produced through participatory research (Eriksen et al., 2021).

To understand the potential and actual contribution of inclusive approaches to research, MEL should be attentive to a broader set of relevant agri-food system factors, including preexisting sociocultural and market regimes (e.g., structural ethnic or gender inequality, limits on profit potential) (van Etten, 2022). Accordingly, CGIAR MEL practices can move toward the following approaches:

- Use more holistic, complexity-aware approaches to assess CGIAR contributions to transformative innovation systems, including measuring network functioning (e.g., participant heterogeneity, interaction intensity) (Fernandez de Arroyabe, 2021; Toillier et al., 2020). Rather than organizing MEL systems toward quantifying adoption of technologies and associated benefits, complexity-aware evaluation will emphasize increased capacity, infrastructure, and empowerment of local innovation systems (Douthwaite & Hoffecker, 2017).
- Further inform inclusive innovation in practice by exploring key questions such as:
    - How to identify groups to be actively included, and how and where should boundaries be drawn?
    - Which governance practices should be used (e.g., conflict resolution value consensus)?
    - How should CGIAR researchers position themselves within partnerships and co-innovation processes (i.e., what is their comparative advantage)?
    - What benefits result from inclusive practices? When and to whom do they accrue?

A learning agenda for inclusive innovation will also deepen understanding of the interrelationships among "agricultural institutions, policies and regulations, social protection, infrastructure and markets, relative prices, off-farm employment opportunities, structural poverty and the scarcity of asset endowments" and their collective influence on farmers' incentives and capacities (Piñeiro et al., 2020).

**Measuring inclusive innovation** faces perennial challenges (e.g., evidence gaps, inconsistent use of measurement tools) as well as additional obstacles related to applying monitoring, evaluation, and learning methods to integrated systems research. New measurement approaches are emerging, and recent institutional criteria increasingly align with inclusive approaches to innovation.

***Reflection toward action in CGIAR***

*How can new measurement and reporting approaches enhance inclusivity within One CGIAR? As decision-makers prepare to use One CGIAR's streamlined Technical Reporting Arrangements in the first annual and triennial reporting rounds, they may consider how such reports can contribute to the holistic and complexity-aware approaches needed to allow inclusive innovation to flourish.*

# 9. Summary

This Note reports on emergent concepts and practices for inclusive innovation in agri-food systems and concludes that CGIAR can strengthen its comparative advantage in context-specific, transformative agri-food systems research by building its capacity for inclusive innovation. In the absence of a universal framework for inclusive innovation, ISDC recommends that CGIAR pursue a learning-while-doing agenda that integrates well-developed guiding principles and expands testing of evidence-based strategies for navigating trade-offs, advancing inclusivity through partnerships, fostering mindset and behavioral shifts through institutional changes, and measuring gains in inclusive innovation.

To advance an inclusivity transition, ISDC encourages CGIAR leadership to:

- **Disrupt** assumptions underlying research priority setting, and **rebuild** by crafting new institutional narratives that recognize stakeholder diversity and dynamism, by promoting reflexivity and inclusive models for research teams and projects, and by defining CGIAR's comparative advantage in demand-led, integrative, and transdisciplinary research.
- **Test** institutional reforms, and **measure** how well these promote authentic participatory interaction with a broader set of agri-food system actors, steer researchers toward analysis and communication of trade-offs, and encourage trust-based co-innovation that balances multiple stakeholder objectives.
- Dynamically **invest** in adaptive programming, higher-quality partnerships (i.e., with greater duration and scope), and pooled funding initiatives that model inclusive co-creation to **deliver** relevant, legitimate, credible, and effective solutions that advance CGIAR's five defined impact areas.

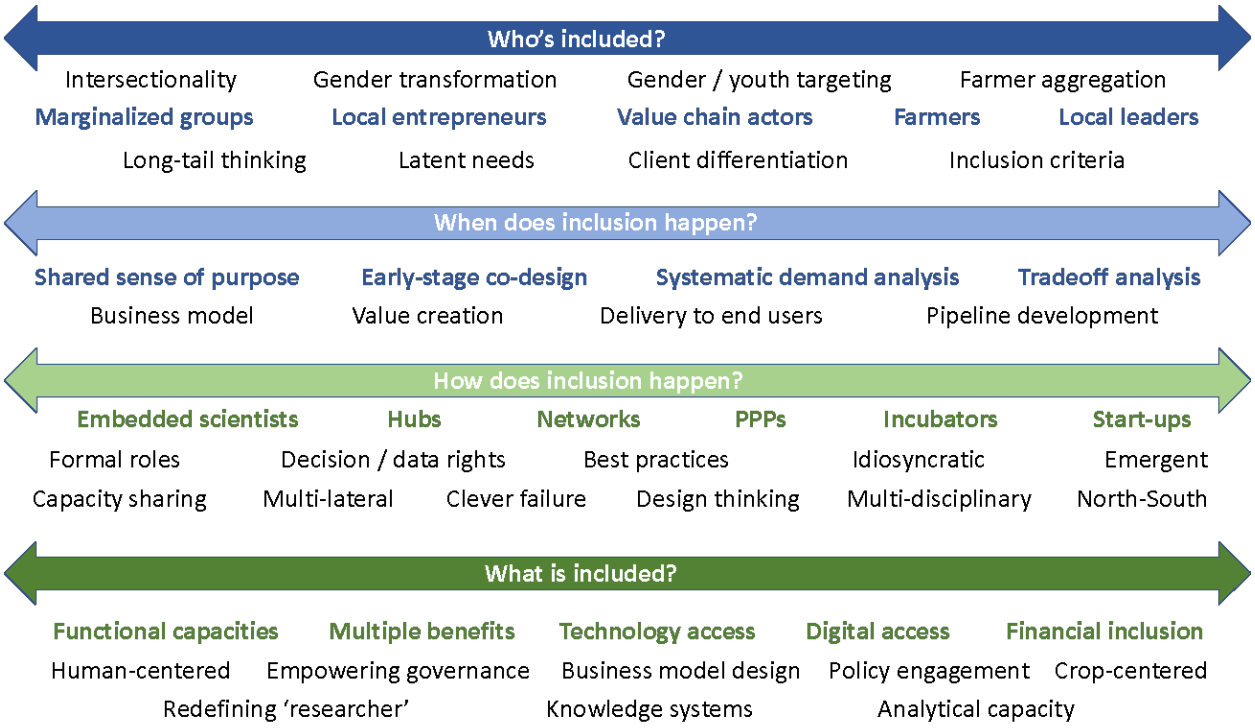
By embracing *incremental innovation* within CGIAR institutional processes and partnerships, CGIAR can more effectively contribute to *transformative innovation* of food, land, and water systems in a climate crisis.

# Annex 1: Expert consultations

Consultations with the following experts were held during June 1–22, 2022 with:

- Hugo Campos (Deputy Director-General Research a.i., CIP, Peru)
- Jacob van Etten (Principal Scientist-Digital Inclusion, Alliance Bioversity-CIAT, Spain)
- Godefroy Grosjean (Senior Scientist-Climate Action/Asia Regional Leader/Global Leader Advisory Services, Alliance Bioversity-CIAT, Vietnam)
- David Guerena (Scientist-Digital Inclusion, Alliance Bioversity-CIAT, Tanzania)
- Faridah Ibrahim (Business Development Lead, WorldFish, Malaysia)
- Young Wha Lee (Breeding Informatics Lead, CIMMYT, South Korea)
- Rachael McDonnell (Deputy Director-General Research, IWMI, Italy)
- Alessandro Meschinelli (Consultant, Collective Action for Forgotten Foods; GFAR)
- Soroush Parsa (Agriculture Officer, Innovation & Digital Agriculture, UN FAO/ former Lead Innovation Scientist, CIP, Alliance Bioversity-CIAT, Chile)
- Valeria Pesce (Consultant, Collective Action on Inclusive Digital Transformation of Agriculture; GFAR)
- Selvaraju Ramasamy (UN FAO)
- Graham Thiele (Director, RTB Program, CIP, Peru)
- Ann Waters-Bayer (Senior Advisor, International Support Group, Prolinnova)

The diagram below organizes terms and concepts shared during the consultation calls according to major questions associated with inclusive innovation. While limited in scope, these consultations suggest that inclusive innovation concepts and practices are heterogeneous among CGIAR researchers and partners.



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CGIAR Independent Advisory and Evaluation Service
Via di San Domenico 1, 00153 Rome, Italy
Email: isdc@cgiar.org
URL: https://iaes.cgiar.org/isdc