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Evolution of the One CGIAR's research and innovation portfolio to 2030: approaches, tools, and insights after the reform

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In this perspective, we offer insights into the evolution of CGIAR's research and innovation portfolio from 2019 to 2023, underpinning the transformative journey towards One CGIAR. With this contribution, we aim to strengthen the social and environmental sustainability components of allied, future Research for Development (R4D) portfolios. We explore three interlinked operational frameworks—Quality of Research for Development (QoR4D), Comparative Advantage (CA) Analysis, and Inclusive Innovation—and present practical tools and lessons for enhancing the quality and impact of R4D initiatives. This work is based on insights gained by the Independent Science for Development Council (ISDC) during the review of proposals for the current One CGIAR research portfolio. QoR4D's four dimensions (relevance, scientific credibility, legitimacy, and effectiveness) guide research strategy, portfolio development, evaluation and performance standards, fostering intentional design and transparent assessment. CA Analysis leverages organisational strengths, facilitating purposeful partnerships, and strategic resource allocation. Inclusive Innovation emphasises stakeholder inclusivity, amplifying legitimacy, relevance, and effectiveness. Insights are drawn from the application of these frameworks, highlighting the importance of collaboration, the need for a mindset shift and institutional reform, specialisation, and impact maximisation. By adopting these lessons, CGIAR and allied organisations can collectively address global food system challenges more effectively, driving sustainable agricultural innovation and societal transformation. This article aims to contribute to advancing sustainable agriculture and underscores the significance of systemic collaborations in creating more resilient and equitable food systems.

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INTRODUCTION

For the past 5 decades, CGIAR has been a pioneering force in agricultural science and innovation for development. This global research partnership comprises approximately 10,000 dedicated staff, 12 Centres, and an extensive network of partner organisations and funders. Through their collective efforts, CGIAR Centres and programmes have achieved significant scientific breakthroughs that have positively impacted the lives of hundreds of millions living in poverty. Effective delivery of the CGIAR's mandate is hampered by a series of pressing crises driven by escalating climate change, unsustainable practices, biodiversity loss, and conflict. Increasingly, the global changes we are witnessing are happening faster than our ability to respond, highlighting the need for a clear organisational strategy and agile management.

Further, structural issues steeped in the history of the organisation, lead to ongoing inefficiencies and funder fatigue. Several previous attempts at putting a more contemporary governance system in place have been largely ineffective¹. For instance, Leeuwis et al.² argued that the CGIAR was struggling to fulfil its international mandate of conducting strategic research, requiring a shift in policies.

A general acknowledgement that the original structure of the CGIAR was no longer fit-for-purpose led to another ambitious institutional transformation process that began in 2019, resulting in the establishment of a seemingly more cohesive and purpose-driven global research organisation known as One CGIAR. Specifically, the System Council of the CGIAR endorsed a set of recommendations to create "... an institutional environment in which a research programme modality based on integrative thinking on food systems and land- and waterscapes can truly thrive³".

A forward-looking, CGIAR 2030 Research and Innovation Strategy (CGIAR Strategy) expands the organisation's original vision and mandate to explicitly address new global challenges⁴. This strategy was co-developed over a 2-year period with input from funders, staff, government officials, and representatives of intended beneficiaries. To fulfil the new mission "to deliver science and innovation that advance the transformation of food, land and water systems in a climate crisis", the CGIAR Strategy pursues measurable benefits across five Impact Areas:

1. Nutrition, health, and food security
2. Poverty reduction, livelihoods, and jobs
3. Gender equality, youth, and social inclusion
4. Climate adaptation and greenhouse gas reduction
5. Environmental health and biodiversity

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To support these Impact Areas, One CGIAR's research is strategically clustered into three Action Areas. *Systems Transformation* aims to address complex agricultural, environmental, and societal challenges through multi-sectoral policies and strategies, fostering partnerships to drive large-scale change. *Resilient Agrifood Systems* focuses on sustainable productivity, safe food availability, health improvement, and environmental sustainability, contributing to job creation, gender equality, and improved livelihoods. In the *Genetic Innovation* Action Area, genetic resources are managed to enhance crop improvement, accelerate varietal turnover, and increase yields, thereby enabling foundational advancements across all Impact Areas.

With a unified governance model, One CGIAR promotes institutional integration across CGIAR Centres and Initiatives and fosters systemic collaborations with local and global partners based on a dynamic foundation of existing partnerships, knowledge sharing, assets, and global presence. The three Action Areas are underpinned by 33 transdisciplinary Research Initiatives designed to enhance the impact of CGIAR's Research for Development (R4D) mission. By consolidating resources with fewer institutional boundaries, empowered management, unified governance, and an integrated operational structure, One CGIAR aspires to achieve greater collective impact by producing international public goods (IPG), an area where CGIAR demonstrates a strong track record^{5,6}. However, these are aspirational goals and it is too early to tell whether the reform will deliver on the promised value-addition and efficiencies.

The governing body of One CGIAR, the System Council, is advised by the Independent Science for Development Council (ISDC), an external, impartial standing panel of experts in R4D on all science-related matters. ISDC is operationally supported by the CGIAR Independent Advisory and Evaluation Service (IAES). Based on 4 years of CGIAR reform and organisational restructuring (2019 to 2023), this paper shares insights from members of ISDC and IAES, and two experts engaged in specific projects.

The purpose and prime motivations for this article are twofold: firstly, to provide much-needed transparency on how the new research and innovation portfolio was developed, and secondly to share the tools we developed and subsequent insights that we gained with other R4D organisations and their leaders. We contend that both, the tools and the way they were developed and applied, are highly relevant to any research organisation concerned with sustainable development.

During the CGIAR reform process, ISDC reviewed key strategy and project documents, using a rigorous Quality of Research for Development (QoR4D) framework⁷ to ensure the scientific integrity of the emerging portfolio. These publicly available reviews highlighted issues that require attention in creating R4D portfolios. Here, we briefly outline ISDC's key insights with a focus on three interlinked operational frameworks crucial for One CGIAR and any other not-for-profit (NFP) organisation operating in R4D to fulfil their missions. Specifically, we discuss:

- the assessment of the new research portfolio using a QoR4D framework;
- the importance of a rigorous definition and functional analytical tool for determining comparative advantage (CA) of an NFP organisation; and
- the imperative of inclusive innovation as a cornerstone for future success.

On their own, none of these elements lend themselves to anything other than theoretical contemplation. However, embedded into an operational framework with inbuilt reflection points they provide a constructive method to critique and review scientific ideas in terms of their research-worthiness and their likely impact. It is the way we have woven these elements together into a comprehensive framework and then applied it to

improve an entire organisational research portfolio that is scientifically noteworthy.

The One CGIAR research portfolio is a work in progress. Further improvements will be iteratively implemented in the coming years. ISDC will use these and other frameworks to contribute to improved quality, rigour, and impact focus of the One CGIAR research portfolio.

We conclude with a reflection on how other R4D organisations can leverage these frameworks and incorporate them into their efforts to promote gender-responsive approaches. This is crucial in the fight against poverty, hunger, climate change, and the environmental footprint of agri-food systems. By sharing these insights, we aim to contribute to the broader effort of advancing sustainable agriculture and food systems in a complex and often changing, global context.

QUALITY OF RESEARCH FOR DEVELOPMENT

The Quality of Research for Development (QoR4D) framework provides guidance on the evaluation of scientific quality, encompassing scientific credibility, and the potential for achieving development outcomes. It has been developed by ISDC as a dynamic framework^{7,8} and serves the following purposes: (i) developing research strategies and programmes, (ii) building a new research portfolio, (iii) establishing, monitoring and evaluation systems, and (iv) designing performance management standards. Establishing QoR4D involved a consultative process with representatives from CGIAR. The framework builds on previous work^{9–12} and consists of four key elements:

Relevance pertains to the importance, significance, and usefulness of research objectives, methodologies, processes, and findings within the problem context and society, in relation to CGIAR's capacity to address issues effectively.

Scientific credibility necessitates robust research findings and evidence-based sources of knowledge. This includes safeguarding data accuracy and presenting and interpreting findings clearly.

Legitimacy means that the research process is fair and ethical and perceived as such. It encompasses the ethical and equitable representation of all stakeholders and the consideration of their interests and perspectives. Legitimacy emphasises transparency, effective management of potential conflicts of interest, and genuine involvement of partners (including farmers) in co-design and codelivery, demonstrating recognition of their contributions.

Effectiveness (“positioned for use”) entails generating solution-oriented knowledge, products, and services that contribute to innovations, outcomes, and impacts. It implies designing and implementing research within a dynamic theory of change, with appropriate leadership, capacity development, diverse research skills, and support for creating an enabling environment to translate knowledge into action, and generate desired outcomes.

The core principles underlying QoR4D include:

- Collaborative design and ownership
- Providing a frame of reference that can be periodically revised, designed to support the creation of long-term programmes
- Alignment with the CGIAR Strategy
- Applicability to both current and new research endeavours
- Adaptability to assess multiple levels—research institutes, projects, teams, individuals

In 2021, ISDC applied QoR4D to review the new CGIAR Strategy and to create independent proposal assessment review criteria. The design of the proposal assessment process incorporated outcomes from a survey and multiple co-design consultations with CGIAR science leaders⁸. A key outcome from these

Table 1. In 2021 these 17 criteria were mapped to the four QoR4D elements and applied to review the new CGIAR initiatives.

| Criteria |
|--|
| 1. Clearly defined research problem that addresses CGIAR Impact Areas, is a high priority in the targeted geographies, is well aligned to shared, multi-funder priorities, and is well-informed by previous research findings |
| 2. Evidence that the Initiative is demand-driven through co-design with key stakeholders and partners (Investment Advisory Groups, governments, private sector, funders), and research collaborators within and outside CGIAR |
| 3. Research questions, objectives, outputs, and outcomes are aligned to the research problem, are measurable with defined milestones and stages amenable for assessment and corrective action through the project life cycle |
| 4. Theory of change with intended outputs, outcomes, and impacts at scale are clearly described. Assumptions are documented, causal linkages are clear, especially the role of partners in driving impacts. All indicators including stage-gate indicators are made explicit |
| 5. Research methodology and methods (and supporting activities) are fit-for-purpose, feasible, are state-of-the-art, and rigorous in data collection and analysis. Limitations are clearly stated |
| 6. Analysis of trade-offs and synergies across the CGIAR Impact Areas. <i>Ex-ante</i> assessment of project benefits provides logical rationale for scaling of impacts |
| 7. Evidence that the initiative will likely lead to impacts at scale through integrated systems approaches that drive innovation in research and partnerships, including linking to and leveraging of other Initiatives within and outside CGIAR |
| 8. Ethics, including equitable partnerships, information disclosure, biases, and potential conflicts of interest are considered. The proposal defines how formal research ethics approvals will be sought/granted |
| 9. Research design and proposed implementation demonstrate gender and social inclusion that can be tracked in outcomes |
| 10. A risk framework that details main project risks and mitigation actions, including intended and unintended consequences of technologies/innovations for natural resources, GHG emissions, and social and economic aspects |
| 11. Capacity statements indicate why the proponents are the ideal implementers for the work. The value proposition is stated and CGIAR capacity and appropriateness to lead the work is justified. This includes the skills, diversity, and multi-/trans-disciplinarity of the research team and collaborators |
| 12. Capacity building within project teams, partners, and stakeholders is evident in project activities. This can include the development of early career researchers and partner staff, support/empowerment for under-represented stakeholders, building partner networks |
| 13. Project management mechanisms and (if applicable) additional scientific oversight and governance measures effectively and efficiently support the Initiative objectives |
| 14. Justified and transparent costing explicitly linked to expected Research for Development results |
| 15. Anticipated research outputs (knowledge, technical, or institutional advances, specific technologies or products, policy analyses) are described and knowledge/gaps they will fill are evident with a demonstrated focus on quality, forward-looking, and impact relevance and how they will be disseminated. Protocols for open-data and open-access compliance are evident in the plan (including the budget) |
| 16. Monitoring and evaluation (M&E) plan for the Initiative is clearly defined, with the flexibility to adapt. The M&E plan supports effective management and learning, including baseline data collection, and evaluative and review processes corresponding to stage gates and course-correction decisions. M&E occurs during the life of Initiative and is used proactively to reflect on and adapt the Theory of Change, where appropriate |
| 17. Well-defined plan for Initiative-level evaluation and impact assessment based on expected end-of-Initiative outcomes and impacts. Links between the impact assessment plan and indicators in the Theory of Change are clear |

consultations was that science leaders found it challenging to mainstream the elements of legitimacy and effectiveness in planning, management, and practice. To address these challenges, ISDC mapped the four QoR4D elements to more granular 17 criteria used for assessing proposals (Table 1). These reviews are publicly available¹³ and contribute significantly to the establishment of the current research portfolio.

In terms of proposal assessment, the criteria serve to provide specific feedback for improving individual proposals and their later implementation, as well as advice on proposal quality for funders. To evaluate the effectiveness of the QoR4D framework when applied to research proposals and to enhance its future use, ISDC conducted an ex-post analysis of the Initiative review process¹⁴. This analysis included an expert reviewer survey and structured interviews with proposal developers and senior science leaders within CGIAR. The first data collection occurred at the conclusion of the proposal reviews, with an online questionnaire sent to all proposal reviewers. The response rate was 64% ($N = 53$). Reviewers strongly agreed (94%) that the use of a four-point Likert scale per criterion was appropriate and 79% agreed that a four-point scale supplemented by qualitative assessment provided sufficient specificity.

The evaluation showed science leaders within CGIAR valued the principles of the QoR4D framework and supported the establishment of criteria for assessing research proposals. Applying the

QoR4D framework is supported by a theory of change, another tool that CGIAR research proposal authors employed that describes causal links between research outputs, development outcomes, and impacts.

The aim of QoR4D is to provide a transparent framework for research that goes beyond focusing solely on the quality of science (e.g., replicability of methods, publication of outputs in high-impact journals, etc.) and incorporates explicit consideration of pathways that maximise the likelihood of achieving desired development outcomes. While CGIAR primarily focuses on research and not development, there is increasing demand to demonstrate how its research is positioned and designed for maximum likelihood of major impact². This marks a significant shift for an organisation that traditionally emphasised research relevance and science quality¹⁵.

CGIAR research must be of high quality and relevant to the 2030 sustainable development goals (SDGs). In practice, the CGIAR 2030 Research and Innovation Strategy recognises the need to accelerate global progress towards the SDGs and targets multiple benefits and transformative change across the five SDG-focused impact areas mentioned above. However, linking science quality to development impacts poses significant challenges such as the complexity of attributing impacts when multiple actors are involved. Even where bibliometric analysis can quantify the quality of science in a development context¹⁶, there may be a

weak relationship between research excellence and societal impact¹⁷. Furthermore, researchers focused on discovery or strategic research may resist embracing development impact-focused thinking. The QoR4D framework offers an approach to incorporate impact pathways in research design, namely by expanding beyond classic metrics of relevance to science and scientific credibility, and giving special attention to relevance to development, legitimacy, and effectiveness. This is achieved in practice by including criteria in research proposals that drive consideration of pathways to impact (e.g., partnerships, scaling, ex-ante assessments of potential impact, Theory of Change) that causally link inputs, outputs, outcomes, and impacts. We stress that these criteria are not fixed; they should be co-designed with researchers to ensure that they fully appreciate what their work will be assessed on. Criteria are context-specific and should be updated regularly to reflect the organisational strategy, in line with adaptive governance principles. For instance, the criteria that were specifically developed for the 2021 ex-ante assessment of the One CGIAR research initiatives are presented in Table 1. They will be revised for the next round of assessments.

Good practice and good governance of publicly funded research require periodic independent review and evaluation. Similarly, the performance of advisory bodies requires periodic external review as do internal change (reform) processes. The elements of the QR4D framework would serve as a suitable guide for such reviews and help in answering evaluation questions such as: Was the process relevant to the needs of the system? Was it seen as legitimate by stakeholder groups? Was it effective (resulting in actionable advice and change pathways)? And has it been credible, based on a method that might be replicated?

COMPARATIVE ADVANTAGE ANALYSIS

The assessment of the Research Initiative proposals revealed that while the term Comparative Advantage (CA) is widely used, no common understanding exists of what constitutes CA, how it should be determined, and how this might lead to strong, mutually beneficial partnerships¹⁸. Here, we provide an overview of CA, its theoretical foundations, and practical applications during portfolio and proposal design and subsequent implementation (CA Analysis). By operationalising CA Analysis, CGIAR can identify and engage in purposive and inclusive partnerships and enhance its and its partners' impacts on global agricultural development¹⁹.

Understanding Comparative Advantage

CA Analysis is a powerful tool that allows organisations to maximise their impact by identifying their relative strengths and capabilities, fostering effective collaborations, and attracting further funding. CA identifies the benefits derived from collaboration and exchange between individuals, organisations, or nations based on their relative efficiencies in producing different goods and services. CA has been a fundamental concept in economics for more than two centuries, since its introduction by David Ricardo²⁰ in 1817. CA is based on the foundational concept of opportunity cost, i.e., the best alternative use of scarce resources. Even if one party has an absolute advantage in—i.e., is more efficient at—producing all goods and services compared to another party, both parties can still benefit from at least partial specialisation and collaboration or exchange if their opportunity costs differ. That is the essence of CA Analysis: understanding an organisation's *relative* efficiency in producing a desired result or output, both relative to another result/output and relative to other organisations. CA has been applied in international agriculture, comparing it with other sectors of the economy and between countries^{21,22}, but although CA has been part of CGIAR discourse for decades, there are limited examples of it being applied in an R4D context²³.

CA is often confused with competitive advantage. Competitive advantage focuses on the ability to outperform competitor organisations. CA instead emphasises the potential to collaborate and specialise to achieve shared goals. Understanding this distinction is crucial to CA Analysis and to applying the resulting insights effectively. CA Analysis can be a key input for the most sensible allocation of resources and to focus an organisation's efforts to generate the largest impacts by prioritising partners, programmes, and projects to maximise overall effectiveness.

Understanding CA leads to two key insights about the benefits of collaborations among organisations with different capabilities. First, while an organisation may have an absolute advantage in all deliverables, it cannot possess CA in all areas. CA in one domain implies a comparative *dis*advantage elsewhere, which requires an organisation to reflect on its portfolio of activities and outputs. Second, because CA Analysis requires assessing *relative* and not absolute efficiency, it necessitates evaluating other organisations' competencies in producing multiple types of output. That heightened awareness can help an organisation leverage the diverse capabilities of potential partners via collaboration and (partial) specialisation in each organisation's area of CA, thereby boosting overall effectiveness. The more diverse the organisations are in terms of their relative capabilities to produce different deliverables, the more they stand to gain from collaborating, each specialising in their areas of CA.

CA is fundamentally about comparing the trade-offs between different deliverables across organisations. Sources of comparative advantage can be broadly grouped into four categories:

1. Incentives (the degree to which an organisation is oriented to pursue particular goals)
2. Human capital (the skills and knowledge of the organisation's workforce)
3. Biophysical capital (such as labs, genetic material, and equipment)
4. Social capital (the set of existing relationships with other actors).

Looking at each source of CA in turn can help identify the outputs in which an organisation is likely to have a CA. Used skillfully and appropriately, CA Analysis is one of the most powerful tools in economics, offering a framework for identifying areas where an organisation's efforts are most crucial to achieving its impacts-oriented mission. Rigorous CA Analysis can help organisations to effectively prioritise programmes, projects, and partnerships by building an intentional research portfolio that maximises overall effectiveness—not just that of the NFP itself—while delivering on multiple strategic objectives.

CA Analysis can be applied at various scales. As an analysis moves from narrower to broader efforts, it becomes more important to consider possible economies (or diseconomies) of scale and scope. Such considerations may change the initial assessment of CA beyond a simple summation of individual pieces. This is especially important when funding decisions are made based on a broad research objective rather than specific work packages, as it can help to define and refine the aspects of that effort that are most sensible for the organisation to undertake.

Operationalising Comparative Advantage Analysis

The CA Analysis process includes four key operational steps: describing desired deliverables, identifying potential partners, assessing relative trade-offs and planning partnerships (Fig. 1). These steps can occur in parallel or sequentially, ideally involving partners who will play instrumental roles in describing desired deliverables and formulating proposals. The process should be iterative, allowing for routine refinements and adjustments until an appropriate action plan is identified.

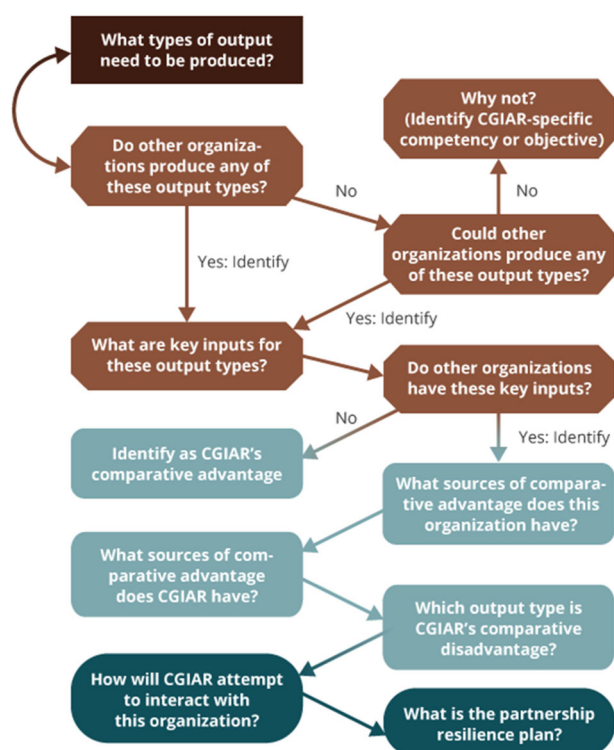


Fig. 1 CA Analysis (coloured by steps). Note that while “Identifying Potential Partners” is listed as the second step, it does not discount the involvement of existing partners in the initial steps or in formulating proposals. Existing partners may provide valuable insights into the necessary deliverables and aligning with development objectives. The analysis should be dynamic, with updates and reassessments conducted in response to the evolving capabilities and the changing landscape.

Describing desired deliverables: This step involves identifying the specific pieces that need to be brought together to achieve the development objectives. The deliverables should be concrete enough to clearly identify the inputs required for their production.

Identifying potential partners: It is essential to identify other organisations that have the potential to produce some of the necessary deliverables. These organisations can be currently active in the agricultural R4D space or have the resources and characteristics needed to contribute to the deliverables.

Assessing relative trade-offs: This step involves using the best available knowledge to identify the relative costs of the key deliverables among the identified organisations, including CGIAR. Even if an organisation is not as capable as another in an absolute sense, their differing relative strengths may justify a partnership.

Planning partnerships, refining proposals: Once potential partners have been identified, this step involves reaching out to them, clearly establishing responsibilities within the project, and ensuring project resilience. Collaboration and specialisation in areas of comparative advantage can lead to faster progress and greater impact on the desired deliverables.

Comparative Advantage Analysis in practice

CA Analysis’s practical applications are particularly relevant to One CGIAR’s platform technologies which provide fundamental support for creating IPGs. CGIAR assets, such as gene banks, research facilities, and some intellectual assets are examples of platform

technologies. Broad access to such platform technologies maximises their use and innovation. Through CA Analysis, CGIAR can identify areas for specialisation, collaborate with other organisations and ensure broad access to platform technologies.

Efforts to adapt an organisation’s CA require careful consideration of resource allocation and trade-offs, including any inevitable transaction costs associated with partnerships²⁴. Research managers must justify investments in new capabilities by demonstrating their relative advantage vis-à-vis potential partner organisations, remaining cognizant that acquiring or expanding CA in one direction may require sacrificing it in some other area. Therefore, research managers should consider if investing in a new CA aligns with the organisation’s relative advantage compared to potential partner organisations. This decision-making process should also identify alternative uses of resources that must be sacrificed to make the new investment. By continuously updating and reassessing institutional capabilities and the changing landscape, organisations can adapt and seize evolving opportunities in science and innovation.

To guide organisations in understanding and conducting impactful CA Analysis, ISDC has produced comprehensive resources, including technical notes, examples, blogs, videos, and audio clips²⁵. They provide step-by-step instructions on how to conduct a CA Analysis and guiding the user through a logical sequence of questions to answer using quantitative and qualitative data, as available, outlining the four main aspects of the analysis. ISDC’s resource materials also include concrete examples applied retrospectively to several completed CGIAR research activities across various aggregation levels.

By applying CA Analysis, organisations can develop a more streamlined and intentional research portfolio that is forward-looking and dynamic. Leveraging CA Analysis will lead to more purposive partnerships allowing more rapid progress towards common goals. Hence, ISDC recommends using this approach when refining the current One CGIAR research portfolio.

INCLUSIVE INNOVATION

The CGIAR 2030 Research and Innovation Strategy establishes the delivery of innovations as the connector between research outputs and development outcomes. ISDC’s strategy review⁷ prompted its subsequent advising to CGIAR to ensure inclusivity in innovative systems and processes. The impetus for inclusive innovation has unfolded over decades beginning in the mid-1990s with demands by development funders for plausible evidence of social, economic, and environmental impacts from agricultural R4D investments^{26,27}. After a wave of reforms culminating in 2007–8, CGIAR operated under new expectations that research generating IPGs would be designed and measured in terms of development, environment, and health impact^{1,2}. With inadequate global progress towards sustainability and equity^{28,29}, CGIAR and other agricultural R4D organisations are increasingly obliged to demonstrate that they apply inclusive practices⁷ to achieve more effective integration of agricultural technologies and interventions within agri-food systems^{30–32}. Hence, ISDC decided to make inclusive innovation a specific criterion by which to assess the emerging research portfolio.

The QoR4D framework emphasises that inclusive research processes are essential to achieve CGIAR’s mission. A robust capacity for inclusivity is a source of comparative advantage in high-risk, long-horizon agricultural R4D that generates IPGs and fuels systems innovation among marginalised populations and agricultural systems^{18,33–35}.

While there is no universally agreed conception of inclusive innovation, one definition is “the means by which new goods and services are developed for and by those who have been excluded from the development mainstream, particularly the billions living on lowest incomes³⁶”. Heterogeneous concepts and practices of

inclusive innovation draw upon a range of underlying world-views³⁷. Various frameworks focus on the improved characterisation 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 producer communities, novel modes of knowledge exchange and emergent collaboration, and system-level sustainability transitions. In practice, inclusive innovation tends to emphasise affordability of agricultural products and services, local entrepreneurship, capacity building, social empowerment, and system-level change³⁸.

Inclusive innovation is not a product, but a contextualised process that engages local actors (e.g., producers, small-scale entrepreneurs) as drivers of diverse innovation outcomes. The CGIAR 2030 Research and Innovation Strategy recognises that partnership-based innovation is required for its research outputs to contribute to development outcomes. 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 needs³⁹.

Inclusive innovation practices draw from various domains of social science, tools, and practices of venture-capital-supported innovators, grassroots activists, and participatory development programmers. Inclusive innovation, as a contextualised process, acknowledges that co-innovation is insufficient without explicit and active inclusion of marginalised groups and attention to intersecting vulnerabilities¹⁹.

Specific actions have been identified as momentum builders, falling into four groups of strategies¹⁹:

- 1. Navigating the trade-offs that are ubiquitous throughout agri-food systems**^{24,37,40–43}: Agricultural R4D organisations need to be intentional and transparent about potential winners and losers resulting from research-enabled innovation. Multidimensional decision-making, from household to policy levels, can be enhanced by building capacities in trade-off analysis and undertaking system-level modelling in combination with evaluative studies. Mitigating approaches, such as socio-technical bundling, can be deployed^{37,44}.
- 2. Strengthening partner relationships to ensure that research outputs are better integrated within wider development and systems change agenda**: Expanding and deepening the duration, scope, and quality of partner relationships, including early-stage engagement and focus beyond participatory trials. Effective facilitation and robust assessment of public-private partnerships are essential for continual improvement^{45–50}.
- 3. Fostering institutional changes that inspire authentic participatory interaction and co-innovation**: Strategies should focus on shifts in the labour force and organisational mechanisms to enable inclusive innovation as part of an institutional change. This includes performance management that plans for and rewards skills such as self-assessment, participatory modes, and multidisciplinary and transdisciplinary research^{51–53}.
- 4. Measurement of inclusive innovation**: Embedding inclusive innovation requires alternative measurement approaches (e.g., qualitative and mixed-method monitoring). Addressing evidence gaps and obstacles related to monitoring, evaluation, and learning in integrated systems research are key areas for improvement^{45,54,55}. New measurement approaches are emerging, and recent institutional criteria (e.g., demand-driven co-design; equitable partnerships) increasingly align with inclusive approaches to innovation¹⁹.

CONCLUSIONS

In this perspective, we have outlined some key approaches, tools, and insights from ISDC regarding the reform of CGIAR's research portfolio from 2019 to 2023. We focused on three operational frameworks: Quality of Research for Development (QoR4D), Comparative Advantage (CA) Analysis, and Inclusive Innovation, which we regard as fundamental for One CGIAR to deliver on its mission. These frameworks are generally applicable to all R4D organisations operating in the agriculture and food space. All resources needed to use these frameworks are freely available on the ISDC website (<https://iaes.cgiar.org/isdc>). Based on our analysis, we offer the following summary and recommendations:

Quality of Research for Development (QoR4D)

QoR4D framework provides a comprehensive approach to assess the relevance, scientific credibility, legitimacy, and effectiveness of research.

The operationalisation of QoR4D by CGIAR researchers, management, and independent reviewers which led to the establishment of a new research portfolio and enhanced the impact of CGIAR's R4D activities, demonstrated the applicability and feasibility of the framework.

The framework should be periodically revised to align with the CGIAR Strategy, ensuring it remains applicable to current and future research endeavours.

Partnering and allied research organisations can also benefit from adopting the QoR4D framework to enhance the quality and impact of their research. Regular revisions and updates are essential to maintain its relevance.

Comparative Advantage Analysis

CA Analysis helps identify an organisation's relative strengths and capabilities, enabling effective collaborations and resource allocation.

Understanding CA and distinguishing it from competitive advantage is crucial for applying CA Analysis effectively.

CA Analysis should be dynamic, with ongoing reassessments and adaptations to changing capabilities and the evolving R&D landscape.

CGIAR should continue applying CA Analysis at all levels of the system to optimise its research portfolio, engage in purposeful partnerships, and maximise its overall effectiveness. Other organisations can benefit from conducting their own CA Analysis to identify areas of CA and foster collaborations.

Inclusive Innovation

Inclusive innovation, involving the active participation of stakeholders including farmers throughout the co-design of research activities, is essential for the legitimacy, relevance, and effectiveness of research.

CGIAR has made progress in incorporating inclusive practices, but further advancements are needed to address challenges and ensure equitable impact.

Strategies such as navigating trade-offs, strengthening partner relationships, fostering institutional change, and alternative measurement and metrics approaches can support inclusive innovation.

CGIAR should continue prioritising inclusive innovation, strengthening partnerships, and fostering institutional change to achieve its development objectives. Other organisations should embrace inclusive practices and explore strategies to overcome challenges in their research endeavours.

Final reflections

Collaborative and functional partnerships are crucial for addressing global challenges in our agriculture and food systems. CGIAR should actively seek partnerships and engage with other research organisations, governments, and both non-profit and for-profit entities to leverage resources and expertise. ISDC's work on foresight, trade-off analysis, and megatrends should guide CGIAR and their existing and potential partners in identifying emerging challenges and opportunities, enabling proactive planning and strategic decision-making.

The insights gained from the latest CGIAR reform process and the frameworks developed to enhance the quality and impact of research are likely to prove useful for other organisations in their own portfolio development and to enable collaboration between these organisations and the CGIAR. Publicly funded agricultural research for development organisations are under pressure to demonstrate increased impact⁵⁶ in addressing global challenges of poverty, food security, gender, and social inclusion, climate change, and environmental degradation. Hence, it is important to share lessons not just from innovation in research and delivery but also from institutional processes.

By adopting these recommendations, CGIAR and other R4D organisations can take a targeted and deliberate approach to reduce poverty, hunger, and the environmental footprint of food production, contributing to sustainable development and positive societal impacts.

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COMPETING INTERESTS

The authors declare no competing interests.

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