

ISDC Concept Note  
Some Reflections on Comparative Advantage as It Applies to CGIAR

Purpose

This additional resource for the 16<sup>th</sup> meeting of System Council sets out a concept note developed by the Independent Science for Development Council ('ISDC') entitled, "Some Reflections on Comparative Advantage as It Applies to CGIAR." For years, CGIAR stakeholders have sought to define the System's comparative advantage (CA). With this concept note, ISDC aims at putting the concept of CA to effective use in research portfolio management at all levels within CGIAR, now that the One CGIAR structure makes portfolio approaches possible and especially salient. Built on this concept note, ISDC will propose a framework co-designed with CGIAR stakeholders to enable CGIAR funders, research managers and scientists to assess if and where CA exists, as well as where it might be desirable to invest in establishing CA where it does not presently exist.

Action Requested

System Council is invited to consider this concept note and provide reflections to ISDC in its attempt to develop a CA framework to be used in the future stage-gating of Initiatives and for vetting new or revised Initiative proposals.

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## Some Reflections on Comparative Advantage as It Applies to CGIAR

For years, CGIAR stakeholders have sought to define the System's comparative advantage (CA). For example, the CGIAR System Reference Group was established in 2018 "as a forum in which Funders and the [System Management Board] can assess CGIAR's comparative advantage and design bold action to better deliver research and innovations that support global efforts to address the world's fragile food system." The 4<sup>th</sup> System Council meeting (May 2017) flagged the importance that the CGIAR "consider comparative advantage and alternative sources of supply."

### CONCEPT NOTE AIM & CORE RECOMMENDATIONS

One hears many claims of CGIAR's CA with respect to one or another type of research-for-development (R4D). Often, there is no clear and consistent basis, nor credible empirical evidence, for those claims. ISDC hopes to contribute to putting the concept of CA to effective use in research portfolio management at all levels within CGIAR, now that the One CGIAR structure makes portfolio approaches possible and especially salient. Toward that end, we have two core recommendations:

- ✓ Create a common understanding across CGIAR about the meaning and use of CA, and
- ✓ Provide a framework to enable CGIAR research managers and scientists to assess if and where CA exists as well as where it might be desirable to invest in establishing CA where it does not exist.

**The term 'comparative advantage' is used in quite varied ways within CGIAR right now.** Often that represents an innocent error born of insufficient understanding of the concept. This is evident, for example, in the recent rounds of CGIAR Initiative proposals, each of which included a section on CA. We reviewed 30 Initiative proposals to examine how CA was used (Appendix 1). Most commonly, we found that Initiative proposals used the term to describe the stock

of available research inputs, i.e., a critical mass and mix of research scientists with appropriate skills, especially in the context of multi-disciplinary teams, location and geographic spread of operations, CGIAR as an honest broker, ability to partner and leverage scaling partners, long track record of research, ability and reputation.

Initiative proposals rarely used the concept to refer to CGIAR research outputs, outcomes or impacts, although that is its proper application (on which, more below). More specifically, 18 Initiatives made no, or at best tangential, reference to outputs, outcomes or impacts in the context of CA, whilst another 8 Initiatives made some claims about outcomes or impacts but provided little or modest evidence to support these claims. Four Initiatives provided good evidence of their CA in outcomes and impacts, with two of these (in the genetics area) demonstrating absolute advantage, although none expressed these outcomes relative to other providers. One Initiative thoughtfully described how they are well placed to provide cost-effective and desirable outcomes and impacts compared with alternative R&D providers.<sup>i</sup>

This is a missed opportunity. **CGIAR investors, managers and scientists should care about CA because CGIAR investors and partners explicitly target multiple impacts that require achieving multiple outputs and outcomes and there exist multiple current and prospective providers of those outputs and outcomes.** Prudential stewardship of scarce investor and partner resources implies not wasting resources. The principle of CA implies focusing different research entities on different types of R4D so as to maximize total impact achieved given scarce investor and partner resources. To do otherwise is intrinsically wasteful. Taking a more thoughtful approach to assessing CGIAR's CA can strengthen portfolio management and expected CGIAR research impacts.

**CA is a powerful concept, arguably one of the most powerful theoretical insights of economics.** CA was introduced to explain the gains from international trade, or exchange more broadly. CA—and its relative, absolute advantage—can only be assessed

with reference to other prospective outputs and alternative research suppliers. CA is intrinsically about comparisons in at least two dimensions: alternative outputs/activities and alternative providers/suppliers.

**Note that CA is NOT the existence of critical mass or a favorable reputation, although those were the most common uses of the term found in the Initiative proposals.** Those oft-heard misuses of the term CA relate instead to 'capacity' to produce (or to produce at or above minimum acceptable quality and scale), what economists term the organization's 'endowments'. Endowments are critically important. However, alone they do not determine CA, which depends as well on (at least) the skill with which and the scale and scope at which those endowments are employed,<sup>ii</sup> and cannot be abstracted from comparisons across outputs and providers.

### COMPARATIVE ADVANTAGE CONCEPT

The CA concept in its essence is as follows. There exist multiple entities (people, countries, organizations, etc.) that each desire multiple outputs (or impacts), each of which is produced using some method that requires one or more distinct inputs. If the entities differ, then they will be differentially good at producing one output relative to another output and relative to the other prospective supplier(s).

Even if an entity is the world's best at producing each output (i.e., holds absolute advantage), that advantage will be greatest for (at least) one output and least for (at least) one other output. This implies gains from trade if each entity specializes in that output(s) it produces relatively better than other outputs as compared to other entities. That's the essence of CA.

The key is that CA is always defined relative to other prospective producers and about one output relative to (at least) one other. One always has CA in something, never in everything.

Note that CA can be dynamic, changing over time. If there is strategic value in building CA in domains in which CGIAR does not presently hold CA, then investments to build CA can be a reasonable strategy. Inertia can be a powerful force that leads to obsolescence if an R&D organization does not adapt

and evolve. But by its very nature, investing in building CA in new domains implies sacrificing CA in some other output(s)/impact(s). One cannot accumulate CA in additional outputs/impacts without simultaneously losing CA in one or more other outputs/impacts.

Further, building new CA also implies a commitment to check that CGIAR has, within a reasonable time period, attained such CA, else scarce investor resources would be better spent pursuing those lines of R4D through other suppliers who do hold CA in producing that output/impact.

Moreover, there always exist some prospective losers (e.g., those within CGIAR in whose areas CGIAR does NOT hold CA). Those researchers or investors most interested in specific activities in which CGIAR does not hold CA will naturally resist reallocation of resources towards research domains in which CGIAR does hold CA.<sup>iii</sup> Hence the politics of the use of the term. Internal resistance arises naturally to calls to carefully consider CGIAR's CA when making portfolio allocation decisions.<sup>iv</sup>

**Defining CA in R&D is a frontier area of research** because innovations aren't like cloth or wine, the examples David Ricardo used in laying out CA theory originally,<sup>v</sup> and a public goods-oriented R&D organization does not have natural market price feedback mechanisms to guide portfolio allocations the way commercial firms do. **The CGIAR could help push thinking on this topic, not just to the benefit of its own portfolio management but also to help position CGIAR on the frontier of R4D.**

### RECOMMENDATIONS

System Council/ISDC should develop a framework that CGIAR managers at all levels can use to help

1. **define** the methods and data by which R4D organizations like CGIAR can **identify** and **demonstrate** their CA, and
2. apply the method to CGIAR adaptive portfolio management. This would complement CGIAR's increasingly mainstreamed use of the **quality of research for development (QoR4D) concept and toolkit**.<sup>vi</sup>

We pose a few conjectures to consider as CGIAR leaders reflect on CA:

✓ **Because R&D involves investment subject to uncertainty**, CA is defined in part by appetite for risk and time horizon. Private, for-profit firms and publicly-funded (e.g., bilateral governmental) organizations are typically bound to short-run returns. Such organizations are fundamentally conservative – hyper risk averse because there exist such grave costs to leaders from any failure. CGIAR may have latent CA in riskier, longer-run agricultural R&D.

✓ CA will also be **affected by mission—e.g., monetizable returns vs. public (or at least club<sup>vii</sup>) goods**. CGIAR is in the business of producing international, even global, public goods. So, outputs with high prospective social impact relative to commercial market potential—e.g., seed varieties for poor smallholder farmers, improved foods for poor consumers—seem natural loci of CGIAR's CA.

✓ Together, the prior two criteria imply that **low commercial value/high social value, high risk, long horizon R&D may often represent CGIAR's CA**, especially as compared to high value commercial crops (like maize) with many alternative suppliers (e.g., life sciences firms, elite universities).

✓ CA also **depends on the input endowments one has and the technology(ies) one employs to use those endowments**. In agricultural R4D, for example, genetic collections are an important input, of which CGIAR holds relatively large collections (at least for some crop genera). Meanwhile, CGIAR might not be quite as cutting-edge in genomics, bioinformatics, and gene editing equipment and techniques, as compared to some alternative providers.

**CGIAR's unusual combination of contextual and scientific expertise with substantial research facilities in its target regions makes it an exceptionally good platform provider.**

CGIAR's genetic collections, physical presence/facilities for *in situ* discovery and adaptive research in low-and-middle-income countries (LMICs), relationships with NARS, etc. differ markedly from most for-profit agrifoodtech firms or advanced research institutes in the Global North, while the scale of its scientific staff and facilities distinguish it from most LMIC government and non-profit organizations, making CGIAR a distinctive platform that enables other entities to partner to undertake value additive agricultural R4D.

The context-specificity of agricultural R4D makes such platforms more valuable than in some other sectors of the economy or science. CGIAR's CA may arise from its ability to bring together relevant scientific and location-specific expertise to modularize problems (i.e., draw boundaries around complex problems to address a more specific challenge) and to foster combinatorial innovation (i.e., custom tailoring combinations of different, pre-existing knowledge to create advances suitable to the context).

Platform valuation includes the platform's catalytic and indirect impacts not just its direct impacts.<sup>ix</sup> ISDC notes that CGIAR has already begun using the "platform" terminology, for example with reference to cross-cutting Big Data, Gender and Genebank Platforms and, now with Impact Area Platforms. Regional Integrated Initiatives, in particular, might be usefully conceptualized as platforms for CGIAR global research initiatives and other partners, local and global.

## PLATFORM CONCEPTUALIZATION

It may be that CGIAR R4D has characteristics akin to that of 'platforms', i.e., an integrative product/service provider that enables others' R&D. Platforms do one or both of two things. They

1. **reduce search and transactions costs** for third parties that might otherwise not find or work with each other, and/or
2. **achieve economies of scope**, inducing complementary investments among technologies that are best combined rather than separate.<sup>viii</sup>

## A WAY FORWARD

Methodologically, it seems unlikely that one can ever get credible, comprehensive data on the cost of producing a unit of any target CGIAR impact, the way one can estimate the cost of a case of wine or a bolt of cloth. So CGIAR likely needs to develop a sequence of vetting questions that it poses to assess CA at moments of research evaluation, such as the funding of new Initiatives, or stage-gating and expansion or extension of existing ones.

#### KEY QUESTIONS TO UNDERPIN RIGOROUS ASSESSMENT OF COMPARATIVE ADVANTAGE

- ✓ Who does or could do this research?  
(to identify candidate alternative suppliers)
- ✓ If no one does it, why don't they?  
(to assess the value of the output/outcome)
- ✓ If others do it, would there be benefits from competition (e.g., faster delivery into public domain)?
- ✓ Is CGIAR better than others at this in terms of highest net social benefit/cost ratio?  
(this establishes absolute advantage; the ratio of those ratios is CA)
- ✓ If CGIAR does this research, what will CGIAR not do that could otherwise be tackled with the same resources?  
(to identify alternative uses, or opportunity costs, of scarce resources)

One could envision a framework built around a decision tree along such lines for stage-gating funded Initiatives and for vetting new or revised proposals, in the way CGIAR used QoR4D to review Initiative proposals in 2021-22.

Ideally, one could test whether using the resulting CA assessment method improves investment performance. That would require comparing selections made under the old system (or some other counterfactual method) with selections made under new system. How could one do that? Possibly through dual reviews that use alternative methods to see which proposals score highly no matter if/how one assesses CA and which proposals' rankings/assessments are sensitive to the method of CA assessment.

**ISDC thinks the time is ripe to develop a framework to assist CGIAR investors and managers in assessing CA of the 2022-24 Investment Prospectus and its constituent Initiatives.** This can help reinforce both commitment to QoR4D and to the framing of Impact Area Platforms thereby increasing One CGIAR's credibility.

### Appendix 1

#### Summary of claimed comparative advantage drawn from the 32 Initiative proposals

*This table merely summarizes the claims made within the Initiative proposals in order to illustrate the diverse uses (and misuses) of the concept of comparative advantage. ISDC offers no assessment of the veracity of these claims.*

Initiative Action Area	Initiative	Summary of comparative advantage as stated in the submitted initiative proposals
Genetic Innovation	Accelerated Breeding (ABI)	CGIAR breeding has access to widest genetic diversity of food crops most relevant to low and lower-middle income countries; germplasm and breeding programs specifically designed to meet regional needs and contemporary risks and threats; CA exists because these breeding goals are not fully pursued in national or private breeding efforts, particularly not for food security objectives and markets in low and lower-middle income countries.
Genetic Innovation	Proposal for the Conservation and Use of Genetic Resources (Genebanks) Initiative	CGIAR genebanks are unique in making available well documented, viable, disease-free collections of crops representing diversity from 196 countries gathered over decades. CGIAR's expertise provides a leadership role in genebanks, PGRFA policy, and phytosanitary controls, especially in regions and countries where there is limited capacity.
Genetic Innovation	Market Intelligence and Product Profiling	Expertise in market intelligence, global partnerships; trusted partner/honest broker; partnering with NARES.
Genetic Innovation	Network 4 Enabling Tools, Technologies, and Shared Services (N4ETTSS)	10:1 benefit cost return from CGIAR research, grounding in countries of interest, trusted relationships with NARS, critical mass in breeding, can work across scales regional to local.
Genetic Innovation	SeEdQUAL: Delivering Genetic Gains in Farmers' Fields	Track-record of research; networking and partnering (public and private) for delivery at scale; working with NARES, policy makers and seed value chain actors for rapid multiplication of seed.
Resilient AgriFood Systems (RAFS)	Sustainable Intensification of Mixed Farming Systems	Systems analysis experience, partnerships with Int Agric Research Centers and global thought leaders, multi- and inter-disciplinary teams, partnerships with NARES. Research into practice credentials.
RAFS	Livestock, Climate and System Resilience	Interdisciplinary expertise, strong track record in academic publications and research-for-development outcomes, multi-disciplinary partnerships, laboratory and research stations.
RAFS	Excellence in Agronomy for Sustainable Intensification and Climate Change Adaptation (EiA)	Strong country presence provides understanding of agricultural challenges and opportunities, leverages across an extensive partner network with strong local knowledge, CGIAR is seen as an "honest broker" conducting high-quality research and enhancing public goods and facilitates beneficial relationships between ARIs, NARS, other private and public partners and the international science community.
RAFS	Plant Health and Rapid Response to Protect Food Security and Livelihoods	Track record in coordinating R4D efforts and plant health networks internationally and regionally, global leader in impactful R4D on pests, diseases and weeds, work with partners who have a strong track record in delivering innovations on the ground, multi-disciplinary teams.
RAFS	Protecting human health through a One Health approach	Long track record of research on zoonotic diseases; networks and partnerships in countries of interest, especially with NARS, multi-disciplinary teams that span biophysical, economics, foresight analysis, trade-offs; state of the art lab facilities.



RAFS	SAPLING – Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion	Track record of research and delivery; multi-disciplinary teams; deep knowledge of local context; trusting partner relationships (public and private sector) for at scale delivery, including co-design; international research partnerships.
RAFS	Transforming Agrifood Systems in South Asia (TAFSSA)	Builds on 10+ year history of significant bilateral and CRP investments; strong relationships with demand, innovation, and scaling partners; strong co-design approach; track record of impact delivery; local and global partnerships; high caliber multi-disciplinary teams.
RAFS	HER+: Harnessing Gender and Social Equality for Resilience in Agrifood Systems	Experience in gender-transformative approaches that has breadth and depth across disciplines and the CGIAR; track record in innovative approaches at the intersection of gender and AFS; strong international research partnerships which also includes country partners with a deep understanding of the context to allow, ensure and accelerate impact at scale.
RAFS	Resilient Cities Through Sustainable Urban and Peri-urban Agrifood Systems	International research on UPU food systems across the Global South has been mainly driven by CGIAR in the last two decades; research has been carried out in close collaboration with urban stakeholders and international scaling partners generating an influential set of international public goods; developed methodologies and gender-sensitive indicator frameworks tailored to the multi-stakeholder UPU context that have been adopted by international urban food system networks involving over 200 cities.
RAFS	From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA)	Unrivalled, system-wide, dryland expertise in research in CWANA; Strong partnerships exist with governments, NARS, the private sector, research centers, UN organizations, universities regionally and globally, and international, local and civil society institutions; track record in co-design and leveraging partnerships.
RAFS	NATURE+: Nature-positive Solutions for Shifting Agrifood Systems to More Resilient and Sustainable Pathways	Building on long history of participatory, multi-sectoral approaches to research; co-design approaches and experience in multi-stakeholder platforms; Initiative's partnership with conservation organizations is a unique comparative advantage.
RAFS	Resilient Aquatic Food Systems for Healthy People and Planet	Little private research on aquatic foods and few universities working on aquatic foods that integrate development perspectives, multidisciplinary technical expertise and systems orientation in the same way as the CGIAR; competitive with top global fisheries and aquaculture universities in terms of research excellence; partnerships incorporate most leading researchers and institutions working in this field; long-term in-country and regional partnerships with staff embedded in countries of interest.
RAFS	Transforming AgriFood Systems in West and Central Africa (TAFS-WCA)	Uniquely placed to provide a cost-effective set of results when compared to other partnerships/service providers in WCA due to for the following reasons: expertise that can be drawn from across Centers and disciplines and sectors, ready to scale innovation options, strategic partnerships with regional entities (e.g., CORAF), leverage with private sector.
RAFS	MITigation and Transformation Initiative for GHG reductions of Agrifood systems RelatEd Emissions (MITIGATE+)	Record of accomplishment in research, intellectual leadership, Inclusive agenda, Responsiveness, quality of staff, partnerships, grounding in local conditions, business friendly orientation.
Regional Integrated Initiative (RII)	Asian Mega-Deltas	Stakeholder consultation, co-design, partner with stable institutions, multi-disciplinary teams, regional history and experience.

RII	Ukama Ustawi: Diversification for resilient agribusiness ecosystems in East and Southern Africa	Building on significant bilateral and past CGIAR Research Programs in ESA, UU brings long-standing partnerships with governments, farmers organizations, research institutions, development partners, and private-sector actors. Multi-disciplinary teams and systems research experience.
RII	AgriLAC Resiliente: Resilient Agrifood Innovation Systems Driving Food Security, Inclusive Growth, and Reduced Out-Migration in Latin America and the Caribbean (LAC)	Integrated research focus that links AFS context and incentives facing farmers and other value chain actors with multi-disciplinary research capacity across commodities, systems science, and social science; participatory design and engagement for impact; over 400 staff in LAC region.
Systems Transformation	ClimBeR Building Systemic Resilience Against Climate Variability	Competent researchers, innovative partnerships locally, including scaling partners, and with stakeholders and globally with international researchers, and strong policy engagement and influence, science track record combined with a commitment to impact.
Systems Transformation	National Policies and Strategies for Food, Land and Water Systems Transformation (NPS)	Long track record of working at the science-policy interface, expertise in social sciences, location of staff.
Systems Transformation	NEXUS Gains - Realizing Multiple Benefits Across Water, Energy, Food and Ecosystems (Forests, Biodiversity)	Long history of work in this domain, Offices/staff in each study area, honest broker, multi-disciplinary team, experience in research into use.
Systems Transformation	Rethinking Food Markets and Value Chains for Inclusion and Sustainability	Long track record of research: world-class research capabilities and multi-disciplinary approaches; in-country presence and strong ties to national and local governments, private sector actors, farmer organizations, and development agencies; helped deliver smallholder-inclusive business models: sustained partnerships.
Systems Transformation	Sustainable Healthy Diets through Food Systems Transformation (SHiFT)	SHiFT examines food systems from the consumer perspective, in contrast to the supply-side focus of other CGIAR Initiatives; Multi-disciplinary nutrition and social science research capacity combined with development partnerships; research team includes international research partnerships; build on previous research and CRPs.
Systems Transformation	Transformational Agroecology across Food, Land, and Water systems	Inter-disciplinarity; geographic breadth; bargaining power, partner outreach capacity; honest broker; international partnerships and working with NARES, NGOs, civil society groups, private sector and scaling partners to maximize the chances of success.
Systems Transformation	Foresight and Metrics to Accelerate Food, Land, and Water Systems Transformation	Multidisciplinary, multi-institutional, and multi-geography expertise; World-class modeling capacity, combining biophysical and socioeconomic analysis; close links to international research institutes and government policy departments.
Systems Transformation	Harnessing Digital Technologies for Timely Decision-Making across Food, Water, and Land Systems	Multi-disciplinary teams across biophysical and social sciences; experience and reputation in partnerships to deliver at-scale impact.
Systems Transformation	Fruit and Vegetables for Sustainable Healthy Diets (FRESH)	Brings together expertise from a range of international research institutions into effective multi-disciplinary teams; skills to test and scale end-to-end approaches to increase F&V intake using evidence-informed co-design processes with our partners; WorldVeg has in-country presence and credentials and a well-developed consortium with seed companies.



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<sup>i</sup> Moreover, the term sometimes seems to have been used manipulatively, in an attempt to lend gravitas to arguments that are not actually about CA. CGIAR use of the term 'comparative advantage' is inconsistent at best, misleading at worst. Using ill-defined CA claims as an evasive marketing tactic is a risky strategy. R&D organizations rely on investors' faith in their expertise and CA. Empty claims call into question the solidity of the evidence behind other CGIAR claims of expertise. It invites investors to pull back the curtain and see if there's really a wizard behind it. ISDC is concerned that the CGIAR jeopardizes investor and researcher confidence with inconsistent and misleading (even if unintentional) use of the term 'comparative advantage'.

<sup>ii</sup> Economies of scale exist when increasing all inputs (e.g., funds and scientists) increases outputs or impacts by an even greater factor. Economies of scope exist when there exist synergies among outputs/impacts such that producing multiple of them reduces the unit costs relative to producing just one of them. Economies of scale refer to efficiencies gained from greater volume, economies of scope to efficiencies that arise from greater variety.

<sup>iii</sup> This follows directly from what economists call the Stolper-Samuelson theorem: those workers whose skills best produce outputs in which the entity does not hold CA lose out relative to those whose skills best produce the output in which the entity holds CA.

<sup>iv</sup> A relevant case study is the US National Aeronautics and Space Administration (NASA)'s struggles with internal resistance to open innovation. The introduction of an open innovation model at NASA led to unprecedented scientific breakthroughs but required organizational effort to help NASA scientists redefine and refocus their identity as R&D professionals. See [Lifshitz-Assaf \(ASQ 2017\)](#) and [Lifshitz-Assaf, Tushman and Lakhani \(HBR 2018\)](#).

<sup>v</sup> John Stuart Mill first turned Ricardo's 1817 classic *On the Principles of Political Economy and Taxation* into the term 'comparative advantage' in Mill's 1840s writings.

<sup>vi</sup> ISDC [Quality of Research for Development in the CGIAR Context](#), January 2020.

<sup>vii</sup> A "club good" is a specific subtype of public good from which people or organizations can be excluded. An example would be information behind a paywall. Pure public goods – like open access information and data – are non-excludable.

<sup>viii</sup> Microsoft, Google, Facebook, and Amazon are good examples of platform technology producers. They once produced standalone products–apps–but evolved to mainly provide platforms (operating systems, app stores, etc.) for others' apps.

<sup>ix</sup> Platform valuation often suffers from attribution uncertainty, as it can be hard to disentangle the synergistic benefits created by the platform from the direct benefits created by a single product/output.