



Task Force 02

SUSTAINABLE CLIMATE ACTION AND INCLUSIVE JUST ENERGY TRANSITIONS

Strengthening Multilateralism, Climate Action, and Sustainable Food Systems through Agricultural Technology Transfer

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Abstract

Research and development are engines of economic growth in the current environment of Industry 4.0. As such, the effective use and commercialization of intellectual assets can fuel value creation while addressing complex societal, national, and regional challenges. Fostering technology transfer is crucial to ensure that regions most vulnerable to climate change are equipped with the capacity to develop and gain access to agricultural technologies that empower climate action and sustainable food systems. The journey from innovation to impact, especially in the Global South, is often hindered by a critical bottleneck—inadequate technology transfer mechanisms. G20 countries must urgently forge multilateral initiatives that: i) incentivize innovation and technology transfer through market pull approaches, aligning innovation with market demands, thereby accelerating the journey from lab to market; and ii) incentivize localized innovation and technology transfer in a globalized system, advocating for solutions rooted in the needs of specific geographic and cultural contexts. G20 countries should lead international cooperation and partnerships ensuring equitable access to innovations and technologies. The recommendations align with the priorities of the Brazil G20 Presidency by linking climate action, the green transition, and innovation and technology to trilateral cooperation.

Diagnosis of the issue

Innovation plays a crucial role in fostering economic growth and development via the enhancement of agricultural production, optimization of resource use, and promotion of inclusivity, resilience, and sustainability in food systems (Menza, Adeniyi, and Rampa 2024). The fourth industrial revolution (coined Industry 4.0, and when applied to agriculture, Agriculture 4.0) emerges with great potential to contribute technologies that will revolutionize agriculture, such as artificial intelligence, remote sensing, precision fermentation, robotics, nanotechnologies, genomics, and more (WEF 2023). Agrifood-tech startups are one key contributor to propel the introduction of Agriculture 4.0 technologies: these startups act as competitors to dominant food systems actors by disrupting the market status quo, but also engage with these same actors to help scale their technologies (Klerkx and Villalobos 2024). The transfer of such Agriculture 4.0 technologies holds potential to foster international and diplomatic collaboration, as a means of coordinated action toward achieving the Sustainable Development Goals (SDGs) (Menza, Steele, Seke, and Akinbo 2023). Thus, the effective use and commercialization of intellectual assets can fuel value creation while addressing complex societal, national, and regional challenges.

Fostering technology transfer is crucial to ensure that regions most vulnerable to climate change, often within the Global South, are equipped with the capacity to develop and gain access to technologies that empower climate action. Technology transfer is crucial to reduce existing gaps in technological access and productivity, however, transfer is not happening at the scale and pace necessary (Menza, Adeniyi, and Rampa 2024). This is especially relevant for smallholders, for which an estimated 2 billion people are

reliant on 500 million small farms (WEF 2023). In developing countries, the potential market value for investments in climate-smart technologies could reach \$23 trillion by 2030, yet the access to and adoption levels of such technologies remain low among smallholders (Nwokoro et al 2023). Unsatisfactory regulatory and policy environments are a massive factor in this gap. Under-investment in the human capital, research and development engines, and infrastructure to scale constrains not only new outputs but also the transfer of existing technologies (hindered market entry) coming from other countries (Menza, Adeniyi, and Rampa 2024). Effective collaboration across stakeholders with clear governance is essential for successful technology transfer between parties involved.

Multilateral efforts in technology transfer exist, but more concerted action is needed to deliver on the objectives of such agreements. The African Union's action toward agricultural technology transfer provides one such case. The Africa continental policy direction by the year 2063 guides agricultural transformation toward the attainment of specific goals by the year 2025, including ending hunger, tripling intra-African trade in agricultural goods and services, enhancing resilience of livelihoods and production systems, and ensuring that agriculture contributes significantly to poverty reduction (NEPAD 2015). This is exemplified by the Malabo Declaration on Accelerated Africa Agricultural Growth and Transformation; a building block for continental aspirations and pathways through which technologies will be transferred and which identifies financial supports for its implementation, and the Comprehensive Africa Agriculture Development Programme (CAADP) Results Framework, which provides Africa and its partners with a set of goals and results to be pursued in the transformation of the agriculture sector. It gives the political and technical impetus to foster policy alignment and harmonization of interventions geared at advancing the agriculture transformation agenda (NEPAD 2015).

One of the highlights of the 2014 Malabo Declaration is the call on Member States to develop compliant National Agricultural Investments Plans (NAIPs) by 2018 – as key instruments for implementing programmes to deliver on the seven Malabo Commitments (Alqali and Usman 2022). However, throughout the three biennial review reporting periods, the performance of Member States in response to this commitment has been insufficient (African Union 2022).

Despite existing efforts like these to promote multilateral technology transfer, many efforts of piloting and adoption fail to sustain scale after the subsidized support expires (Menza, Adeniyi, and Rampa 2024). Technology transfer from and to smallholder contexts face incompatibility with local farming practices, limited technological literacy and infrastructure, disadvantaged access to markets through many intermediaries, and more. Women and minorities may especially face difficulty to access and benefit from Agriculture 4.0 technologies due to social stigma and fewer opportunities (WEF 2023). Early efforts to invest in multilateral technology transfer lack an established framework for the engagement between developed economies and the Global South. Given the frequent misalignment of interests and priorities, more efforts must intentionally incentivize the transfer of technologies to Least Developed Countries (LDCs), as obliged by the World Trade Organization’s Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement (Menza, Adeniyi, and Rampa 2024).

Recommendations

G20 countries can lead international cooperation toward the equitable access of Agriculture 4.0 technologies by forging multilateral initiatives which i) incentivize innovation and technology transfer through market pull approaches, aligning innovation with market demands, thereby accelerating the journey from lab to market; and ii) incentivize localized innovation and technology transfer in a globalized system, advocating for solutions rooted in the unique needs of specific geographic and cultural contexts.

The imperative for G20 countries to prioritize and advance sustainable climate action and inclusive energy transitions is rooted in their global responsibility as major economic players and contributors to greenhouse gas emissions. In embracing climate justice through financial support and technology transfer, G20 countries can empower LDCs to build resilience and transition to low-carbon economies. This collaborative and proactive stance not only addresses the ethical imperative of climate responsibility but also positions these nations as leaders in fostering international cooperation, laying the foundation for a more sustainable, equitable, and prosperous global future.

G20 countries can leverage their established research and development frameworks – utilizing existing mechanisms and creating new ones fit for purpose – to ensure that the development and commercialization of Agriculture 4.0 technologies are co-developed and adopted by not only their markets but those of the Global South. Public funding can contribute to a more equitable and democratic development process for Agriculture 4.0 technologies. While private sector efforts might prioritize the easiest pathway to market being that of exclusively developed economies, G20 policymakers can incentivize a scaling process which contextualizes these technologies for the Global South. G20

policymakers can also set the research and development agenda to gather more information on the validity of agrifood-tech startups as a vehicle for technology transfer. Governments can work together with academia, philanthropy, and other partners (such as the organizations of the co-authoring team: CGIAR, AUDA-NEPAD, EMBRAPA) to better understand the factors which will improve the success and sustainability of technology transfer pathways (Klerkx and Villalobos 2024).

The first formal recommendation is to incentivize innovation and technology transfer *through market-pull approaches; aligning with market demands and thereby accelerating the journey from lab to market.* Policy directive that would implement market facing approaches include measures such as subsidies, patent protection, tax credits, public procurement and more. Governments and their partners must actively create markets for Agriculture 4.0 technologies to be transferred to: mission-oriented policies and strategic directives will guide the bridging of the development of such innovations to markets which are prepared with the capacity to absorb them, and in which they are aligned to demand (Menza, Adeniyi, and Rampa 2024). Part of this process will involve ramping up efforts to communicate across science, policy, and market barriers. This channel of communication will require more concerted investment by G20 into initiatives that encompass all stages of the development-deployment continuum, especially ensuring to include the final users and beneficiaries of the technologies. Last-mile connections with local markets and distribution channels, and nodes of influence in the community such as key, or ‘nucleus’ farms, will prove an essential component of market-aligned multilateral technology transfer initiatives (Nwokoro et al 2023). Another such strategy to ensure technology transfer efforts are aligned with market demand is innovation bundling: as single technologies may be alone insufficient to contribute solutions to complex

multidisciplinary problems (Menza, Adeniyi, and Rampa 2024). CGIAR works to ensure innovation portfolio management is actively considering the bundling and scaling pathways of its technologies, through the Innovation Packages and Scaling Readiness (IPSR) approach (Schut et al 2024).

The second formal recommendation is to incentivize *localized* innovation and technology transfer in a *globalized system*; *through advocating for solutions rooted in the unique needs of specific geographic and cultural contexts – especially in the Global South*. One strategy to ensure that technology transfer, while multilateral in scale, is localized is co-creation of technologies. Co-creating innovations with smallholders, innovation leaders in the Global South, and other contextual experts preempts potential barriers to adoption. Co-creation at inception also unlocks the potential of developing upon otherwise un-valorized local knowledge – such as using local crop breeds or seed systems. Another strategy to localize innovation in multilateral technology transfer initiatives is to take the Agriculture 4.0 technologies already developed and re-adapt them to unique contexts. Often, technologies tailored to the complex systems of large-scale farming could prove useful to smallholders if simplified (Nwokoro et al 2023). Multilateral transfer efforts must be strategic in promoting the technologies and practices to the socioecological contexts which are primed for their success, involving end-users in the process to ensure which existing technologies would be applicable and which could be enhanced or bundled to be more appropriate.

Scenario of outcomes

The adoption of the recommendations for market-driven and localized technology transfer initiatives shall strengthen multilateralism across G20 countries and their partners and improve progress on the SDGs via the impacts of Agriculture 4.0 technologies.

Countries' commitment to these recommendations could manifest through their participation in the Brazil G20 Presidency's proposed Task Force for a Global Alliance Against Hunger and Poverty, which exemplifies a multilateral effort to fund and scale policies and technologies towards SDG progress (G20 Brazil 2024). Another outcome scenario of adherence to such recommendations by the African Union, for example, may be greater efforts toward monitoring, tracking, and reporting on the implementation of the progress made in the provisions of the Malabo Declaration on Accelerated Africa Agricultural Growth and Transformation using the Comprehensive Africa Agriculture Development Programme Results Framework (NEPAD 2015).

These recommendations may also be implemented in cross-sectoral collaborations, involving public, private, and scientific sectors. CGIAR's Accelerate for Impact Platform is one such venture-space whose activities, for instance its innovation challenges, center market-alignment and localized needs in development and deployment efforts. The methodology is context-specific, beneficiary-centered, and cross-disciplinary, with a particular emphasis on youth, women, and rural communities. Calls for applications are based on a thorough analysis of the existing innovation ecosystem and needs assessment of local agriculture in the targeted geographic (or thematic) scope. A4IP involves partners across sector to ensure that evaluation of the startups and the subsequent curricula are

tailored to the context. A4IP sustains support for innovation through connection to CGIAR scientific expertise, resources, and on-the-ground piloting (CGIAR A4IP 2024).

The scenario of outcomes must also highlight outstanding factors: while technologies hold great promise to drive SDG progress, national and international regulatory systems still lag: lengthy stringent approval processes for the safety of technologies, ethical and legal discrepancies over data use and ownership, errors and inaccuracies in the technologies themselves, etc. Ongoing agricultural practices and human activity pollute the environment, contributing to further climate change. An emphasis on the technologies of Agriculture 4.0 risks also overlooking ‘low-tech’ innovations; those processes, methods, and tools that may still prove transformative for food systems especially in contexts which have a lower capacity to absorb deep-tech advances. As the effects of climate change manifest, the often-long timeline to uptake technologies may not keep pace to deliver the necessary food systems transformation in time. These potential outcomes lend further impetus to the necessity for G20 countries to act immediately; taking swift, coordinated action to forge multilateral technology transfer initiatives.

Appendix

[CGIAR](#) is an agricultural science and innovation for development organization dedicated to developing research-driven innovation, management practices, and policy options to transform food, land, and water systems in a climate crisis through the work of 8000+ scientists and 3000+ partners in over 90 countries. [A4IP](#) is the venture space that leverages CGIAR's legacy in research and innovation to co-design, accelerate, and de-risk the development and deployment of science-based solutions for sustainable agriculture and climate action. A4IP entrepreneurs pioneer models to bridge research products from lab to market, create demand for CGIAR science, and strengthen its role in the innovation ecosystem. A4IP is an initiative powered by the Alliance of Bioversity International and CIAT; a CGIAR research center (Alliance 2023).

[AUDA-NEPAD](#)'s centre of excellence in science, technology, and innovation (AUDA-NEPAD CoE-STI) provides governments with supports on policy enabling environments for genome editing and science-based communication strategies with action plans owned and driven by national governments. AUDA-NEPAD CoE-STI leverages its convening power and political mandate to raise awareness, understanding, and support for the technology among key stakeholder communities engaging in broader technology outreach and awareness. A core role of AUDA-NEPAD CoE-STI is to identify and expose member states to problem-solving innovations whose application will augment and accelerate progress towards attainment of Agenda 2063's goals and targets and to also provide science- and evidence-based backstopping advisory support for the development and management of biotechnology and genome editing-related innovations (AUDA-NEPAD 2022).

EMBRAPA is an innovation-driven company that focuses on the generation of knowledge and technology for Brazilian agriculture. The initiative has been tasked with providing Brazil with food security and a leading position in the international market for food, fiber and energy. To meet such continuous challenge, in permanent dialogue with farmers, scientific organizations and both government and civic leaders, EMBRAPA is guided by the following tenets: scientific excellence in agricultural research, crops and livestock production efficiency and quality, environmental sustainability, social aspects, and partnerships with the production sector (EMBRAPA).

References

African Union, *Biennial Report to the AU Assembly on Implementing the June 2014 Malabo Declaration*, (2022), 1-120.

Alliance of Bioversity International and CIAT, *Accelerate for Impact Platform*, (Webpage, 2023), a4ip.cgiar.org.

Alqali, Adam and Muhammad Usman, *Review BR3: Africa records mixed progress but off-track on 2025 CAADP goals*, (Webpage, March 2022), <https://www.nepad.org/news/review-br3-africa-records-mixed-progress-track-2025-caadp-goals>.

AUDA-NEPAD African Union Development Agency, *Centre of Excellence: Science and Technology and Innovation Hub*, (Webpage, 2022), <https://nepad.org/centres-of-excellence/centre-of-excellence-science-and-technology-and-innovation-hub>.

CGIAR Accelerate for Impact Platform, *A4IP 2023 Year in Review*, (Annual Report, 2024), 1-21.

EMBRAPA, *About EMBRAPA*, (Webpage, N.d.), <https://www.embrapa.br/en/sobre-a-embrapa>.

G20 Brazil 2024, *Task Force for a Global Alliance Against Hunger and Poverty*, (Webpage, N.d.), <https://www.g20.org/en/tracks/sherpa-track/hunger-and-poverty>.

Klerkz, Laurens and Pablo Villalobos, *Are AgriFoodTech Start-ups the New Drivers of Food Systems Transformation? An Overview of the State of the Art and a Research Agenda*, (Global Food Security 40, 2024), 1-10.

Menza, Gianpiero, Daniel Adeniyi, and Francesco Rampa, *Creating an Enabling Environment for Developing and Deploying Market-Ready Science-Based Innovations for Sustainable Food Systems*, (White Paper, 2024), 1-20.

Menza, Gianpiero, Megan Steele, Lukovi Seke, and Olalekan Akinbo, *Creating an Enabling Environment and Accelerating SDGs through Increased Public Funding of Innovative Agricultural Research and Development*, (ThinkTwenty India, 2023), 1-18.

NEPAD Planning and Coordinating Agency, *The CAADP Results Framework: Going for results and impacts, Sustaining CAADP momentum*, (2015), 1-10.

Nwokoro, Charles Chigemezu et al., *Improving Innovation for Smallholder Farmers: A Call for a Collaborative Ecosystem*, (White Paper, 2023), 1-27.

Schut, Marc et al., *Innovation Portfolio Management for Responsible Food Systems Transformation in the Public Sector: Lessons, Results and Recommendations from CGIAR*, (Agricultural Systems 216, 2024), 1-19.

World Economic Forum (WEF), *Scaling Agritech at the Last Mile: Converging Efforts to Farmers' Prosperity*, (Insight Report, 2023), 1-21.



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