

Catalysing the Agri-food Systems Transition through Multilateral Forums: A Multi-Level Perspective on G20 and BRICS

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Working Paper I

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Abstract

This working paper examines how the multilateral economic forums, the G20 and BRICS, shape the sustainability transition of agri-food systems (AFS). Drawing on the Multi-Level Perspective (MLP) from transition studies, it advances a modified framework in which multilateral forums act as a “Multilateral Translation Interface” that converts macro-level landscape pressures into meso-level regime adaptations. The study applies a longitudinal, deductive thematic content analysis to 31 G20 and BRICS agricultural declarations issued between 2010 and 2025. Three key findings emerge from the analysis. First, the landscape pressures articulated by both forums evolved from an early concern with demographic expansion and food-price volatility, through the consolidation of a climate–food nexus, to a post-2020 framing dominated by compounding “poly-crisis.” Second, the two forums pursue divergent regime pathways: the G20 favours a techno-centric optimisation route (digital public infrastructure, food-loss reduction, and market transparency), whereas BRICS advances a social-ecological reconfiguration route centred on smallholders, agroecology, and institution-building. Third, India is analysed as a case to examine if these narratives translate into policy. We found examples where India operationalised these mandates domestically through Agristack, the National Millet Mission, and the National Mission on Natural Farming, though it is impossible to claim causality with this analysis. The paper contributes a theoretical extension to the MLP and a policy account of how nations synthesise competing global mandates into domestic agricultural reform.

Keywords: agri-food systems; sustainability transition; Multi-Level Perspective; multilateral governance; G20; BRICS; India; agroecology; digital public infrastructure.

1. Introduction

Over the past two decades, food systems have faced multiple crises: the 2007-2008 global food price spikes, the escalating impacts of climate change, the systemic supply chain disruptions of the COVID-19 pandemic, and heightened geopolitical conflicts and trade shocks (FAO, 2023). Consequently, the dominant agricultural paradigm characterised by resource-intensive, yield-maximising commercial farming is under significant pressure to undergo a sustainability transition. Countries are increasingly adopting an agri-food systems (AFS) approach to sustainability transitions to deal with the complexities of producing, transacting, distributing and consuming food. However, the transition of AFS towards a healthy, equitable and resilient food system is hard as many of the benefits are social and not monetary. Government policies play an important role in accelerating the sustainability transition of AFS, at least during the initial phases. Global narratives around sustainability also play an important role in directing the policy trajectory.

Within the architecture of global environmental governance, multilateral institutions play a role in setting the normative agendas and policy trajectories. The G20, representing the world's largest economies, and the BRICS bloc, representing major emerging economies, are two of the most influential forums shaping global agricultural policy. Historically, these forums have prioritised macroeconomic stability, trade liberalisation, and aggregate caloric output. However, recent geopolitical and ecological stressors do suggest a paradigm shift in their narrative. Understanding these narratives is important because it shows how global political forums turn big environmental crises into real national policies and farming changes.

To understand this complex systemic shift, this study employs the Multi-Level Perspective (MLP), a prominent analytical framework in transition studies (Geels, 2002; Rip & Kemp, 1998). The MLP postulates that socio-technical transitions emerge through the dynamic, non-linear interaction of three analytical levels. First, the Socio-Technical Landscape (macro-level) consists of the exogenous environment, such as climate crises or demographic shifts, that exerts significant pressure on the existing system (Geels, 2011). Second, the Socio-Technical Regime (meso-level) represents the dominant, relatively stable network of institutions, rules, and technologies characterising the existing system (e.g., commercial agriculture, WTO trade rules, etc.). Regimes are often path-dependent and tend to resist radical change in favour of incremental adaptation (Smith et al., 2010). Finally, Niche Innovations (micro-level) are protected spaces where radical technological or social innovations (e.g., agroecology) emerge. Niches generate solutions that can become mainstream and integrate into the dominant regime when landscape pressures create the windows of opportunity and an enabling environment is created through policies and institutions (Kemp et al., 1998).

While the MLP was originally developed to analyse historical technological shifts, recent studies have also applied it to environmental governance and food systems (El Bilali,

2019). The literature highlights that global transitions are mediated by the international political economy. For instance, the G20 has traditionally approached agricultural governance through the lens of market stabilisation, emphasising the reduction of trade barriers and the enhancement of market information systems like AMIS to manage volatility (Clapp & Murphy, 2013). On the other hand, the emerging economies within the BRICS framework have consistently advocated for a sustainable agriculture technology transfer or sharing, protecting the rural livelihoods, and challenging Western-dominated supply chains (Hopewell, 2017; Margulis, 2014).

Despite the growing literature on agri-food systems transitions, a significant gap remains in understanding how multilateral governance coordinates the global response to compounding ecological and economic shocks. There is a distinct lack of comparative, longitudinal analysis tracking how the G20 and the BRICS bloc diverge in their structural responses to identical global landscape pressures. Failing to analyse the intersection and friction between these two influential forums leaves a critical gap in our understanding of how global agricultural governance actually shapes the trajectory of the sustainability transition and further domestic national policies. Though MLP is uniquely suited for such studies, it has largely been used to understand transition driven by specific technologies and mostly in a national setting.

A common methodological challenge in applying the MLP is the boundary ambiguity among its elements (Smith et al., 2010), which is particularly relevant to global food systems. For example, the boundary between regime and niche becomes less clear when looked at empirically. This study addresses this theoretical gap by conceptualising multilateral forums, specifically the G20 and BRICS, not only as regime actors but as the active interface for translating between the two levels. These forums do not generate landscape pressures (such as climate change); rather, they serve as the geopolitical mechanisms that translate abstract exogenous shocks into concrete, codified regime adaptations and policy mandates.

To address this gap, the present study conducts a longitudinal thematic content analysis of 31 multilateral declarations from 2010 to 2025. Specifically, we ask the following research questions:

1. How have the G20 and BRICS multilateral forums conceptualised and responded to compounding exogenous pressures (Landscape) to reconfigure the global agricultural system (Regime) between 2010 and 2025?
2. How do emerging economies, utilising India as a primary case study, operationalise these divergent multilateral mandates into domestic agricultural policy?

By answering these questions, this paper offers two primary contributions to the literature. The first is a theoretical contribution: this paper advances the MLP framework within global governance studies by demonstrating how multilateral forums function as a translation

mechanism between landscape pressures and regime adaptations, helping to address the traditional boundary ambiguities in transition theory. The second is a policy contribution: by comparing the historical priorities of the G20 and BRICS with the contemporary domestic policies of India, this study provides a case study on how countries synthesise global mandates to operationalise the sustainability transition at the national level and in turn affects the future global mandates through negotiations.

2. Theoretical framework

The Multi-Level Perspective (MLP) is considered a robust “middle-range theory” to analyse the complex, long-term sustainability transitions of socio-technical systems, such as global agri-food systems (AFS) (Elsner et al., 2023). According to the framework, the transitions happen through non-linear co-evolutionary interactions across three analytical levels: the socio-technical landscape (macro level), the socio-technical regime (meso level), and niche innovations (micro level) (de Boon et al., 2022; Leeuwis et al., 2021). A transition occurs when exogenous pressures from the macro-landscape destabilise the existing regime, creating a “window of opportunity” or ‘Overton window’ for radical niche innovations to break through and reconfigure the system (Elsner et al., 2023).

The Socio-Technical Landscape: The socio-technical landscape comprises broad, exogenous structural trends, such as climate change, globalisation, and demographic shifts, that exert pressure on the regime (Elsner et al., 2023; Leeuwis et al., 2021). Issues like climate change and environmental sustainability are global challenges that transcend countries’ political borders; national agricultural policies also have international spillover effects that necessitate coordinated global action (World Bank, 2021). Global climate governance is also influenced by North-South geopolitics, where international negotiations dictate the allocation of mitigation responsibilities between nations (Zurek et al., 2021).

The Socio-Technical Regime (The Dominant AFS): The socio-technical regime represents the dominant, institutionalised rules and structures that currently determine the global agricultural production and consumption (de Boon et al., 2022; Elsner et al., 2023). The current global food regime is commercialised, neo-liberal, and corporate-driven, characterised by economies of scale where the social and environmental costs are externalised (Leeuwis et al., 2021; McGreevy et al., 2022). This regime is maintained through structural, technological, financial, and cultural lock-ins that create path dependencies and resist any efforts towards transformation (Elsner et al., 2023; Leeuwis et al., 2021). Agriculture research and development also feed into this, and emerging economies hold significant leverage; for example, China, Brazil, and India alone account for 60 per cent of public funding for agricultural research and development in the Global South (World Bank, 2021). For the transition to happen, the landscape pressures must create an ‘Overton window’ that destabilises these institutional lock-ins and opens structural pathways for niche-level agro-ecological innovations to scale and challenge

the dominant regime.

Niche Innovations (Pathways to food systems transformation): Niches act as protected experimental spaces where new technologies and innovations (such as agroecology, regenerative agriculture, and green technological innovations) are generated to challenge the existing regime (Elsner et al., 2023; Leeuwis et al., 2021). However, these niches often face opposition from incumbent regime actors and require temporary protection, network-building, and continuous learning to mature (Elsner et al., 2023; Leeuwis et al., 2021). To achieve a global food systems transition, niches must ultimately integrate into or fundamentally transform the regime's deep structure (Elsner et al., 2023). This would imply that purposefully repurposing current domestic agricultural support toward public investments in research and development to foster "green innovations" that promote sustainable use of natural resources while simultaneously raising productivity (World Bank, 2021).

Policy Coherence and Governance in the Transition: Governing this transition across diverse global economies requires navigating complex trade-offs and ensuring policy coherence between agricultural trade and environmental (or sustainability goals) (Coderoni, 2023; Zurek et al., 2021). If an economy acts unilaterally, for example, to price carbon or impose strict environmental conditions on agriculture, it risks "emission leakage," wherein production simply shifts to countries with less stringent regulations, thereby undermining global mitigation efforts (Baylis et al., 2021; Himics et al., 2018). Therefore, a shift toward collaborative, goal-based global governance, rather than strictly rules-based compliance, is required to align the diverse socio-economic realities of G20 and BRICS nations and push for a just transition of AFS (Coderoni, 2023). Ultimately, a successful transition demands a transdisciplinary approach that connects local niche experiments with coordinated international trade and environmental policies at the landscape level (Boix-Fayos & de Vente, 2023), and that is where the multilateral translation interface plays an important role.

To operationalise this transdisciplinary alignment, this paper proposes a modification to the traditional Multi-Level Perspective framework by introducing the concept of a Multilateral Translation Interface. In major economies such as the BRICS and G20, regime lock-ins manifest as institutionalised government subsidies, trade barriers, and entrenched international supply chains that incentivise unsustainable agricultural practices. Rather than viewing multilateral forums merely as static, regime-level actors that defend the status quo, this framework conceptualises platforms like the G20 and BRICS as a dynamic intermediary interface. This Multilateral Translation Interface functions at the intersection of the landscape and regime levels, actively translating macro-level global climate commitments and trade pressures into actionable, coordinated policy instruments within domestic regimes. Consequently, the interface serves as the institutional mechanism that

mitigates emission leakage and harmonises diverse national agendas. The conceptual framework based on this modified Multi-Level Perspective is visualised in Figure 1.

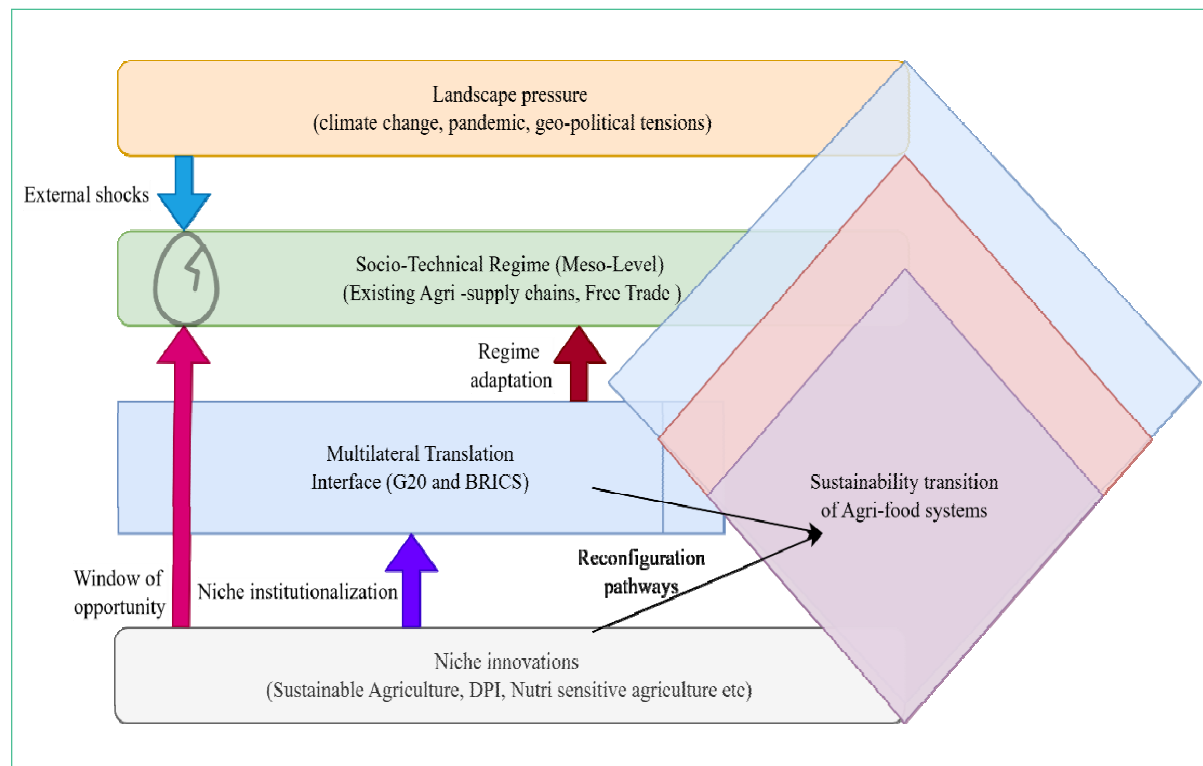


Figure 1: MLP for sustainable transition in Agriculture through multilateral forums.

3. Methodology

3.1 Data and analysis

This study utilizes a qualitative, longitudinal research design. The dataset comprises 31 official agricultural declarations, action plans, and ministerial summaries published by the G20 and BRICS between 2010 and 2025. These documents represent the consensus-driven policy priorities of the member states at the time of publication.

The documents were analysed using a deductive thematic content analysis. The coding framework was derived from the three tiers of the Multi-Level Perspective (Landscape, Regime, Niche). An initial read-through of the documents was conducted to familiarise with the texts. Subsequently, text segments (ranging from phrases to full paragraphs) were coded according to whether they described an exogenous pressure (Landscape), an institutional or market stabilisation effort (Regime), or the promotion of a transformative solution (Niche). The coding tree utilised for this analysis is detailed in Table 1.

Table 1: Coding Tree based on the Multi-Level Perspective (MLP)

Main Theme (MLP Level)	Sub-Theme (Code)	Description / Inclusion Criteria	Example Source Documents
1. Landscape Pressures	1.1 Market Volatility & Population	Mentions of population growth, price spikes, and aggregate food demand.	G20 France 2011; BRICS 2010
	1.2 Climate & Biodiversity Crises	Explicit links between climate change, extreme weather, water scarcity (documented from 2011 in both forums), and biodiversity loss threatening food security.	G20 France 2011; BRICS 2011; G20 Italy 2021
	1.3 Systemic Shocks (Pandemic/Geopolitical)	References to COVID-19 pandemic, or global supply chain disruptions causing systemic vulnerability; including the explicit use of food and fertilizer supply chains as instruments of geopolitical pressure in the Russia-Ukraine conflict context (G20 2022).	G20 Saudi Arabia 2020; G20 Chair's Summary 2022; BRICS 2022
2. Regime Adaptations	2.1 Trade Rules & Market Transparency	Defense of the WTO, open markets, and initiatives like AMIS (G20) and BAIES (BRICS) to stabilize the existing system.	G20 Mexico 2012; BRICS 2011; G20 Argentina 2018
	2.2 Food Loss and Waste (FLW)	Strategies to optimize the current system by reducing post-harvest losses and value-chain waste.	G20 Turkey 2015; BRICS 2024
	2.3 Subsidies & Livelihood Protection	Discourse on protecting small-holder farmers, rural incomes, and reforming unequal global subsidy structures. Family farming emphasized as a founding BRICS priority from 2010.	BRICS 2010; BRICS 2016; BRICS 2021
3. Niche Innovations	3.1 Digitalization & Agri-Tech	Promotion of precision farming, IoT, and Digital Public Infrastructure (DPI) in agriculture. BRICS noted ICT explicitly from 2016; G20 Japan 2019 featured Agroecosystem Living Labs as an overlooked niche.	G20 India 2023; G20 Japan 2019; BRICS 2016; BRICS 2017
	3.2 Agroecology & Climate-Smart Ag	Transitioning to nature-based solutions, bioeconomy, and organic farming practices. One Health approach (G20 2023).	BRICS 2024 Brazil; G20 Germany 2017; G20 India 2023
	3.3 Nutritional Diversification	Shifting cultivation toward climate-resilient, nutrient-dense crops (e.g., millets via MAHARISHI initiative, alternative proteins).	G20 India 2023; G20 MACS 2023 (MAHARISHI); BRICS 2023

Given the volume and density of the 31 multilateral declarations, this study employed an LLM-assisted (Large Language Model – Notebook LM) thematic analysis for initial coding. The LLM was prompted to use a deductive coding strategy, anchoring text extraction strictly to the three established tiers of the Multi-Level Perspective (Landscape, Regime, Niche). To ensure analytical rigour and qualitative reliability, a human-in-the-loop validation protocol was subsequently applied. The primary researchers manually coded a randomized 15% sample (five documents) of the dataset using the established coding tree. A comparison between human-generated and LLM-generated codes demonstrated high conceptual alignment. To further establish qualitative dependability and allow for peer scrutiny, a comprehensive thematic audit trail, linking final analytical themes to verbatim textual evidence from the dataset, is provided in Appendix A.

4. Results: Thematic Evolution across the Multi-Level Perspective

The thematic content analysis of the 31 declarations reveals a distinct, non-linear progression in how global agricultural governance responds to socio-technical transitions. The findings are organised chronologically within the three tiers of the Multi-Level Perspective (MLP): Landscape Pressures, Regime Adaptations, and Niche Innovations.

4.1 The Evolution of Landscape Pressures (Macro-Level)

The exogenous pressures identified by both the G20 and BRICS have shifted considerably over the 14-year period, evolving from isolated economic shocks to interconnected, systemic threats.

Phase 1: The Yield and Volatility Imperative (2010-2015)

In the early 2010s, the dominant landscape pressures were demographic expansion and the immediate geopolitical fallout of the 2007-2008 recession and the immediate global food price crisis. The discourse in these years, both in BRICS and G20, was fundamentally Malthusian, focusing heavily on aggregate caloric output and market stability. In the G20 context, the 2011 G20 Action Plan on Food Price Volatility and Agriculture (France) and the 2012 G20 Declaration (Mexico) explicitly framed agricultural challenges through the lens of macroeconomic vulnerability. The primary concern was that price spikes would destabilise importing nations. Within the BRICS context, the inaugural 2010 BRIC Agriculture Declaration (prior to South Africa's full integration) and the 2011 BRICS Declaration centred on the necessity of boosting agricultural production to feed a growing population, which is again a Malthusian framing. The landscape pressure was treated as a mathematical deficit between supply and demand rather than an ecological limit. The 2011 declaration noted that BRICS countries collectively represented 43% of the world population and 18% of global trade, framing the bloc's agricultural challenge in explicitly demographic terms. Consequently, agricultural research and development

during this period remained bound to the conventional regime paradigm, prioritizing yield maximization over ecological sustainability.

Phase 2: The Emergence of the Climate-Food Nexus (2011-2020)

By the early 2010s, declarations began registering climate change as both an environmental externality and as a direct landscape pressure destabilising the food system. Both G20 France 2011 (Action Plan) and BRICS Chengdu 2011 explicitly link climate change, water resources, and biodiversity to food insecurity, establishing the climate-food nexus as a shared concern from the very first years of these forums. The G20 Germany 2017 Declaration marks an intensification of this agenda, not its origin.

In the G20 context, the G20 France 2011 Action Plan on Food Price Volatility and Agriculture was the first to formally link climate change and water availability to agricultural market stability. The 2017 G20 Agriculture Ministers' Declaration (Germany) subsequently deepened this agenda by integrating sustainable soil management as a formal pillar and referencing the Paris Agreement, representing an intensification of a concern first articulated six years earlier.

In the BRICS context, the BRICS 2011 Chengdu Declaration (paragraphs 11-14) represents an early engagement with the climate-food nexus. It explicitly addresses the “sustainable use of natural resources, land, water resources, and biodiversity,” acknowledges the “triple challenge” of food security, climate adaptation, and greenhouse gas reduction, and calls for research on biomass energy as a climate mitigation tool. The 2013 Pretoria Declaration, held under the theme “The negative effect of climate change on world food security,” consolidated climate change as BRICS’s central agricultural concern by mid-decade. The 2016 and 2017 BRICS declarations subsequently highlighted the vulnerability of developing nations to extreme weather events. By 2019, the Bonito Declaration tied climate adaptation directly to digital connectivity and IoT, viewing technological modernisation as a structural response to climate pressure. This narrative on climate change continued beyond 2020, though competing with the narrative on poly-crisis like Covid-19 and geopolitical conflicts. The 2021 India Declaration explicitly called for “collaborative research for developing affordable and efficient technologies to boost agricultural production and productivity and adapt to climate change impacts,” and introduced agrobiodiversity conservation as a climate resilience tool. The 2023 Limpopo Declaration devoted its first thematic section to climate change impacts, welcoming the outcomes of COP27 and calling for developed countries to provide the financial means of implementation to enable developing nations to adapt. The 2024 Moscow Declaration further referenced COP28’s Emirates Declaration on Sustainable Agriculture and the FAST Partnership, demonstrating the progressive integration of UNFCCC processes into BRICS agricultural governance.

Phase 3: Compounding (Multiple) Crises (or poly crisis) a Systemic Vulnerability (2021-2025)

The post-2020 landscape is characterised by what transition theorists' term "compounding crises," or "poly crisis", simultaneous shocks that overwhelm the existing regime's capacity to adapt. The G20 Matera Declaration (Italy, 2021) and the 2022 G20 Chair's Summary present a landscape where the COVID-19 pandemic, climate-induced natural disasters, and disrupted global supply chains intersect. The 2022 G20 Chair's Summary explicitly names the Russia-Ukraine war as a primary driver of food insecurity, documenting how the conflict has disrupted grain export and affected the input supply chain, like fertiliser and fuel, that developing nations depend upon. This represents the first instance in the dataset where a specific geopolitical conflict is named as a direct cause of food system disruption, a notable shift from abstract geopolitical risk to a named, proximate threat. The G20 2023 Outcome Document records that Russia and China dissociated from or opposed the relevant paragraphs, revealing a significant fracture within the G20 regime itself, a fracture that the BRICS documents could not explicitly mention. The 2023 G20 Agriculture Ministers' Outcome Document (Hyderabad) reinforces this framing, noting that worsening food insecurity in least-developed countries is compounded by "poverty, the Covid-19 pandemic, deepening climate change and biodiversity loss crises, and ongoing conflicts in the world."

The BRICS declarations of 2019-2024 offer a parallel but distinct narrative. The 2019 Bonito Declaration (Brazil) was the first in the BRICS sequence to prominently endorse agri-tech startups as a systemic response to food production pressures, framing innovation entrepreneurship alongside IoT and digital connectivity as structural landscape responses. The 2020 Declaration (Russia) expressed concern that, after a decade of steady decline, the number of people suffering from hunger had again begun to rise, with over 820 million people still hungry globally, and it was the first BRICS declaration to formally assess COVID-19 as a compounding landscape threat to food system stability. The 2021 Declaration (India) introduced agrobiodiversity as a new landscape concern, linking climate resilience and the conservation of wild crop relatives. By 2023, the Limpopo Declaration (South Africa) focused explicitly on the vulnerability of smallholder farmers, women, youth, and Indigenous peoples to climate impacts. The 2024 Moscow Declaration then expanded the landscape frame to a newly enlarged BRICS membership exceeding 45% of the world's population, calling for a grain trading platform (the BRICS Grain Exchange) as a direct institutional response to the fragility of global food supply chains. In all this, the focus has been on the techno-institutional solution, rather than highlighting one of the root causes, that is, geopolitical tensions. On the other hand, this shows that the BRICS remained united, even during these unstable times.

However, the G20's ability to act as a unified translation interface is frequently compromised when landscape pressures are geopolitical rather than strictly ecological. The Russia-Ukraine conflict explicitly fractured the G20's consensus-driven regime. During the 2022 meetings, members clashed openly; while many condemned the war for exacerbating global food insecurity, others argued that unilateral Western sanctions were to blame. By 2023, the institutional fracture was formalized in the G20 India Outcome Document, which had to explicitly document that Russia "dissociated itself" from paragraphs condemning the aggression, while China formally stated that the meeting outcome should not include any reference to the Ukraine crisis at all. This illustrates a critical limitation of our framing of multilateral forums as a transition interface; when landscape shocks directly implicate the geopolitical interests of major regime actors, the multilateral translation interface breaks down.

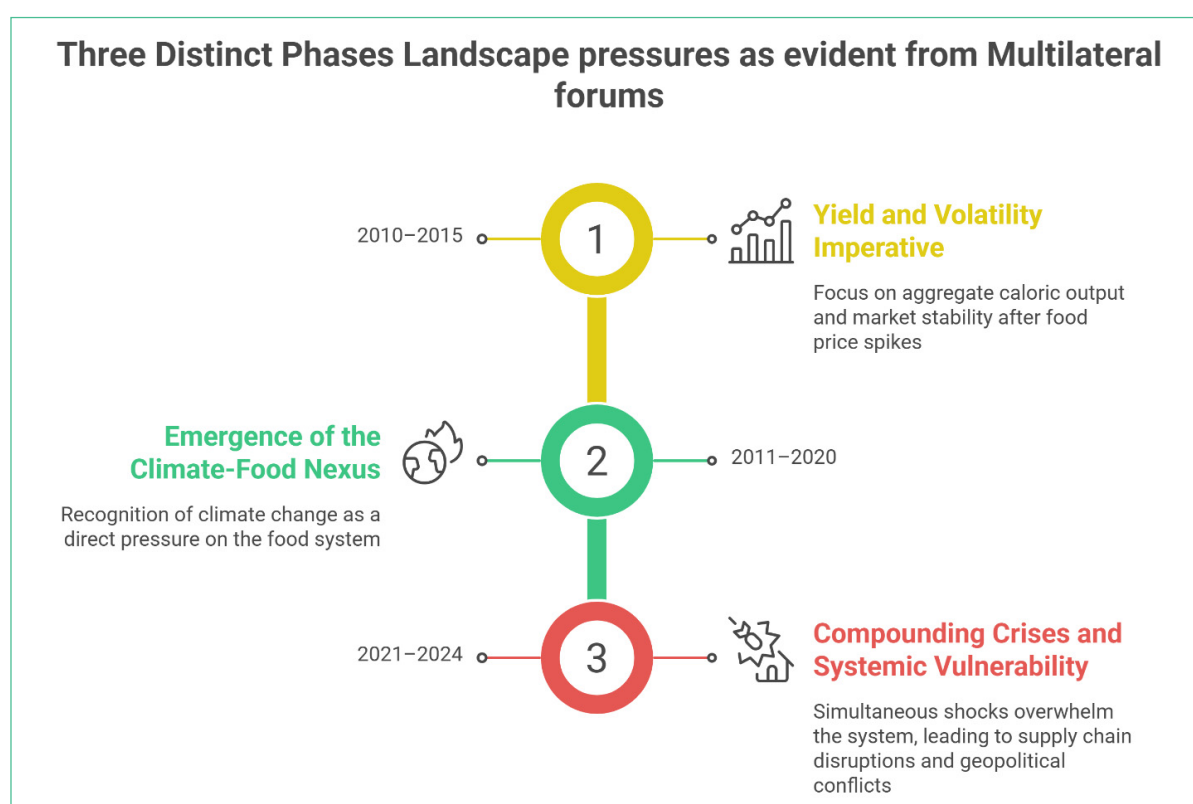


Figure 2: The three distinct phases of landscape pressure.

4.2 Regime Adaptations: Institutional Inertia and Market Stabilisation (Meso-Level)

While the Multi-Level Perspective framework traditionally conceptualises socio-technical regimes within bounded national or sectoral scales, this section argues that the global agricultural food system operates as an interconnected macro regime maintained by transnational rules, multilateral institutions, and global trade networks. In this framing, the sustainability transition is re-conceptualised not as a localised technical shift, but

as a deeply contested structural reconfiguration of these global power architectures, where multilateral interfaces negotiate competing techno-centric and social-ecological pathways.

To insulate this global regime from exogenous shocks and supply chain fragmentation, multilateral forums acting as translation interfaces deploy specific institutional adaptations aimed at market stabilisation. Rather than fundamentally dismantling the dominant agricultural system, both the G20 and the BRICS bloc utilise parallel mechanisms (example, information-sharing networks and trade infrastructure) to maintain regime inertia and prevent systemic collapse. However, their respective mechanisms of stabilisation reflect distinct geopolitical constituencies and divergent institutional designs.

Institutional Architecture and Market Transparency Mechanisms

The most immediate regime defence deployed by these translation interfaces is the optimisation of market transparency to prevent panic buying and export restrictions. The G20 consistently champions the Agricultural Market Information System (AMIS), established during the 2011 French Presidency, as a vital regime tool designed to mitigate food price volatility. The G20 India 2023 Outcome Document explicitly reaffirmed support for AMIS, sanctioning its structural expansion to cover fertiliser and vegetable oil markets in response to recent supply shocks. It is important to acknowledge that BRICS seeks to reform rather than dismantle the incumbent global agricultural regime. BRICS consistently reiterates the importance of an open, transparent, inclusive, and non-discriminatory multilateral trading system consistent with World Trade Organisation (WTO) rules. Rather than entirely rejecting G20 regime tools (WTO favoured), BRICS displays institutional complementarity; during the establishment of the Basic Agricultural Information Exchange System (BAIES), BRICS explicitly noted that such a system should not duplicate the Agriculture Marketing Information System (AMIS) created under the G20, and has called upon technical experts to consider BAIES's possible linkage with AMIS to avoid unnecessary duplications.

An equivalent, yet analytically neglected, mechanism exists within the BRICS framework. The Basic Agricultural Information Exchange System (BAIES), first proposed at the 2011 Chengdu meeting, underwent successive development across the 2013 and 2015 ministerial declarations. Following a trial run in 2015, BAIES was officially launched in 2016 and attained full operational status with an online data platform by 2017. Explicitly reaffirmed in every subsequent declaration from 2019 through the 2024 Moscow declaration, BAIES represents a parallel institutional effort to achieve market transparency and supply forecasting. This institutional adaptation demonstrates that BRICS agricultural cooperation has long been governed by structured, multi-year programmatic commitments rather than merely periodic rhetorical consensus. This continuity is further evidenced by sequential operational frameworks, including the Action Plan 2012–2016, the Action Plan 2017–2020 agreed at Nanjing, the Action Plan 2021–2024, and the landmark 2022 BRICS

Strategy on Food Security Cooperation. Building on this institutional foundation, there is an increasing urgency within the bloc to devise dedicated physical trading mechanisms for agricultural commodities that mutually benefit member countries. As welcomed in the 2024 Moscow Declaration and operationalised in the Action Plan 2025–2028, initiatives like the BRICS Grain Exchange aim to provide independent price discovery and a structural alternative to Western-dominated commodity exchange platforms. By facilitating secure trade settlements, this mechanism ensures the reliable and smooth movement of produce from surplus to deficit regions within the bloc, thereby containing market volatility and shielding members from unintended geopolitical and economic shocks. However, how such a system could be materialised, keeping the national interests and WTO rules under consideration, needs to be further discussed.

Financial and Infrastructure Adaptations

Beyond information sharing, the BRICS bloc has accelerated its regime-building efforts to contest the Global North's influence over physical and financial agricultural supply chains. This evolution highlights a transition from early policy alignment to institution building. The 2015 BRICS Declaration highlighted the establishment of the New Development Bank (NDB) to mobilise resources for sustainable infrastructure. By 2019, the bloc actively recommended utilising the NDB to finance digital and communication infrastructure for rural agriculture and fisheries.

This financial architecture laid the groundwork for deeper structural divergence during the landscape pressures, such as the tariff wars and unilateral trade sanctions witnessed over the past years. The 2024 Moscow Declaration welcomed a strategic initiative to establish the BRICS Grain Exchange, an internal trading platform designed to strengthen intra-bloc trade relations and secure physical supply chains. This initiative was formalised within the BRICS Action Plan 2025–2028 under Brazil's chairmanship, committing member states to facilitate grain trade by actively promoting secure, transparent payment systems and independent trade settlement infrastructure. To further shield member states from input cost surges and macroeconomic shocks, the Action Plan 2025–2028 details protective mechanisms, including the BRICS Contingency Grains Reserve Arrangement and the establishment of a Food Import Financing Mechanism. These instruments provide emergency financial relief and reduce systemic dependence on traditional Western-dominated financial institutions.

Ideological Divergence: Subsidy Reform, Smallholders, and Resource Efficiency

While neither forum advocates for the complete dismantling of globalised food chains, a profound structural divergence persists regarding how the regime should be governed. Across all reviewed documents, both blocs maintain that their actions comply with rules-based multilateral trade under the World Trade Organisation (WTO). However, the G20 emphasises open markets to ensure aggregate global supply, whereas BRICS documents,

particularly the 2021 Action Plan and the 2024 Moscow Declaration, explicitly criticise the historical inequities of the WTO rules-based system. The BRICS bloc consistently advocates for WTO reform that targets the trade-distorting agricultural subsidies of developed nations, which threaten the viability of agricultural sectors across the Global South.

This structural divergence is rooted in the demographic realities of the respective blocs. The very first BRICS Agriculture Declaration in Moscow in 2010 placed family farming at the centre of the bloc's agricultural identity, framing it as the foundational pillar of global food security. Over the 2019–2024 period, this commitment persisted. The 2020 Russia Declaration devoted an entire thematic section to international development assistance programs for vulnerable populations through triangular South-South cooperation. The 2021 India Declaration introduced a specific focus on small and family farmers' empowerment through cooperation, and the 2024 Moscow Declaration explicitly mandated that agricultural policies must accommodate the specific needs of women, indigenous peoples, local communities, and smallholders.

Conversely, the G20, heavily influenced by Global North priorities, approaches regime stabilisation through capital-intensive innovation and supply chain optimisation. This is typified by the G20's framing of Food Loss and Waste (FLW) reduction. Following the 2015 G20 Turkey Declaration, reducing FLW became a central pillar of global agricultural policy, culminating in the G20 India 2023 Collaboration Initiative on FLW. This represents a classic meso-level adaptation that seeks to optimise the existing supply chain through enhanced cold-chain logistics and decentralised warehousing to improve net output without altering the fundamental, intensive mode of production.

Along with the internal optimisation, Western economies led by the European Union are increasingly employing sustainability-related technical trade barriers. While these regulatory measures (such as carbon border adjustments or stringent deforestation-free supply chain mandates) are legal within the WTO regime, they operate as non-tariff barriers that restrict free trade from the Global South. From an MLP perspective, however, these barriers possess a dual character; while they disrupt conventional commercial trade channels, they simultaneously formalise strict environmental criteria for trade. By institutionalising these mandates, such trade barriers can create market premium spaces and markets that allow niche agro-ecological innovations to scale up and challenge the dominant regime of conventional commercial agriculture.

Crucially, from a Multi-Level Perspective, the BRICS framework does not treat nature-based solutions and regenerative agriculture merely as ecological compliance mechanisms. Instead, these environmental transitions are structurally designed to keep smallholder farmers, women, and youth at the centre of the regime reconfiguration. For instance, the 2025 BRICS Declaration explicitly links the acceleration of the “agroecological transition”

to targeted investments in mechanisation tailored for small-scale agriculture, aiming to reduce the drudgery of farm work, increase productivity, and make rural livelihoods more attractive and viable for the youth. Furthermore, the newly launched BRICS Partnership for Land Restoration does not solely focus on carbon sequestration or soil health; it explicitly mandates that restoration projects must address the development needs of family farmers, indigenous peoples, and local communities.

Implications for the Sustainability Transition

From the perspective of transition theory, these competing meso-level adaptations reveal that the global agricultural regime is undergoing a fragmented, sustainability transition. The G20 approach aligns predominantly with a “techno-centric optimisation” pathway, where sustainability is framed as a resource-efficiency challenge to be solved through capital-intensive innovations, digital tracing, and food loss reduction without destabilising the intensive, market-driven, input-intensive mode of production. Conversely, the BRICS focus on smallholders, agro-ecological resilience, and the redistribution of domestic support represents an emerging “social-ecological reconfigurations” pathway. This pathway highlights that sustainability transition cannot be achieved through technological optimisation alone, but requires dismantling the structural inequities and market distortions that marginalise small-scale producers in the Global South. Consequently, the Multilateral Translation Interface becomes a contested arena where the very definition of agricultural sustainability is negotiated, determining whether the future global food system will rely on corporate supply chains or decentralised and ecologically diverse regional networks. However, the burden of cost of sustainability transition such as MRV cost etc should not be on the small and marginal holders.

Institutional Architecture: Action Plans and the BRICS Strategic Alliance

Beyond linguistic declarations, the BRICS forums produced binding Action Plans that operationalised their policy commitments. The Action Plan 2012-2016, adopted at the Chengdu meeting, identified five concrete priority areas with country-level coordination responsibilities. The same 2011 meeting formally established the “BRICS Strategic Alliance for Agricultural Research and Technology Cooperation,” a dedicated transnational research body predating comparable mechanisms in many other multilateral fora. This was followed by the Action Plan 2017-2020, agreed at Nanjing, and the Action Plan 2021-2024, endorsed at the 2021 India meeting. The 2024 Moscow Declaration confirmed that a new Action Plan 2025-2028 under Brazil’s chairmanship, demonstrating structural programmatic continuity. The 2022 China meeting also produced a landmark BRICS Strategy on Food Security Cooperation, the first overarching strategic document dedicated exclusively to this domain. These instruments demonstrate that BRICS agricultural cooperation has been governed by structured, multi-year programmatic commitments rather than merely periodic rhetorical consensus.

Food Loss and Waste (FLW) as System Optimization

A prominent regime adaptation identified in the texts is the shift toward resource optimization. Rather than relying exclusively on expanding agricultural production, which is increasingly constrained by climate landscape pressures, the regime attempts to meet demand by eliminating inefficiencies. Following the 2015 G20 Declaration (Turkey), reducing Food Loss and Waste (FLW) became a central pillar of global agricultural policy. The G20 India 2023 Outcome Document devoted substantial attention to SDG 12.3 and established a dedicated Collaboration Initiative on FLW. This represents a classic meso-level adaptation: improving the existing supply chain infrastructure through better cold-chain logistics and decentralised warehousing to improve output without altering the fundamental mode of production. Preventing food loss and waste is a critical strategy of the sustainability transition. This strategy has also sustained attention within the BRICS framework as a crucial mechanism for regime optimisation. Recognising the urgent need to address these inefficiencies, BRICS nations have committed to developing cooperative frameworks to understand and mitigate food loss and waste across the entire agricultural value chain. For instance, recent BRICS frameworks (Action Plan 2021–2024 and the 2023 Joint Declaration) explicitly mandate cooperation on FLW reduction by sharing technologies, enhancing post-harvest management, and improving cold storage and transportation infrastructure.

Divergence in Regime Priorities: Global North vs. Global South

The thematic analysis reveals that the G20 (heavily influenced by the Global North) and BRICS approach regime stabilisation differently. The G20 documents frequently prioritise the seamless functioning of international agribusiness and capital-intensive innovation, while BRICS documents consistently frame regime stability around rural development and the socio-economic protection of smallholder farmers and indigenous communities.

This divergence has a clear basis in the initial documents. The very first BRICS Agriculture Declaration (Moscow, 2010) explicitly placed family farming at the structural centre of BRICS agricultural identity, framing it as contributing not only to member states' interests but to global food security. This reflects the fundamental values on which BRICS is centred, reflecting the predominantly rural demographic realities of Brazil, India, China, and South Africa. The declarations of 2019-2024 demonstrate that this commitment deepened further: the 2020 Russia Declaration devoted an entire thematic section to "International Development Assistance Programs for Food Security, Nutrition and Support for Vulnerable Populations," calling for triangular South-South cooperation. The 2021 India Declaration introduced the slogan "Small and family farmers empowerment through cooperation," while the 2022 China Declaration endorsed a BRICS Strategy on Food Security Cooperation and the 2024 Moscow Declaration explicitly called for taking into consideration "the specific needs of women, children and youth, indigenous peoples,

smallholders, family farmers, local communities and people with disabilities.” Across this entire period, no G20 agricultural declaration deploys equivalent social-protection language as a structural frame for global governance.

4.3 Niche Reconfigurations: Agroecology, Digitalisation, and Institutional Scaling

If the global agricultural food system is understood as a macro regime, the transition to sustainability occurs when niche innovations are absorbed, formalised, and scaled by multilateral translation interfaces. This process does not follow a simple substitution pathway where the incumbent regime is entirely displaced. Instead, as Geels (2011) conceptualises, it follows a reconfiguration pathway where established actors adopt niche innovations to upgrade systemic efficiency and survive landscape pressures. The interventions of the G20 and BRICS demonstrate how these interfaces select distinct technological, ecological, and digital niches to reshape the normative and physical architecture of the global regime.

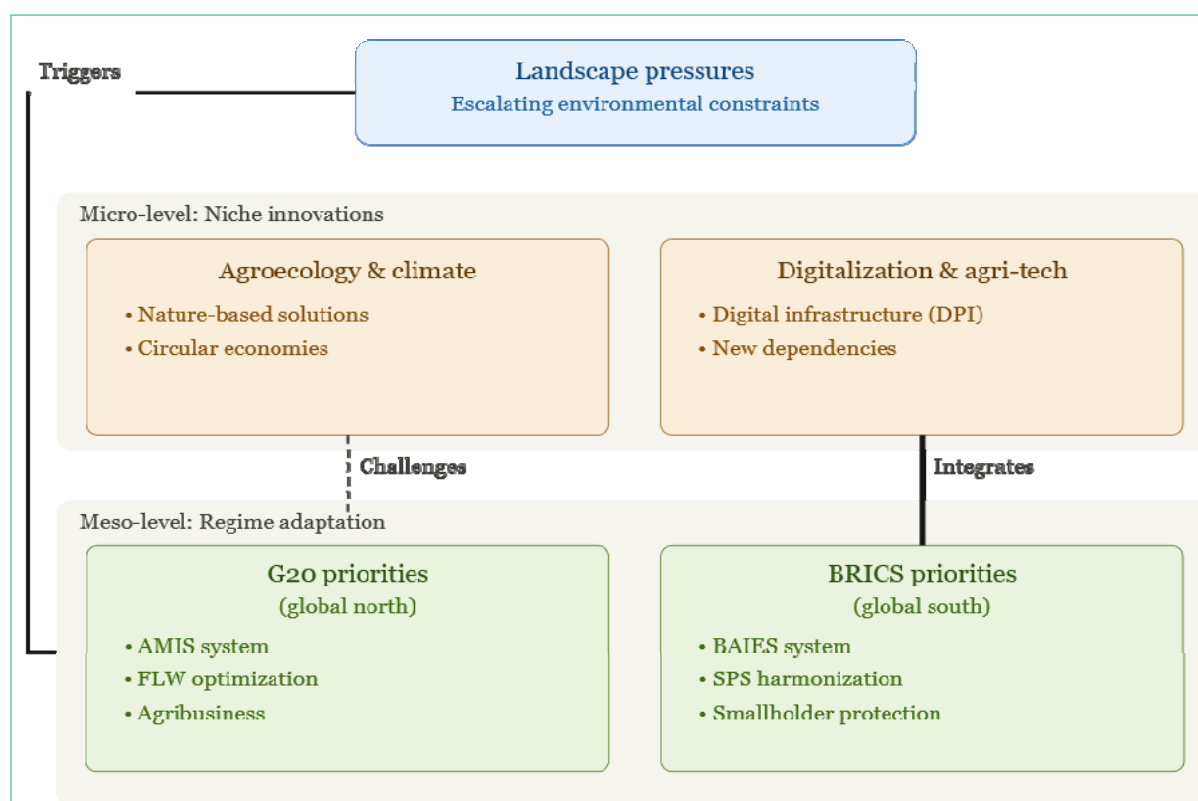


Figure 3: Niche innovations and their integration into G20 and BRICS regime priorities.

Diversification of Production Paradigms: Agroecology and Alternative Crops

While the G20 leans heavily on capital-intensive technological reconfigurations, the BRICS bloc places significant emphasis on scaling ecological and social innovations. The 2023 BRICS Joint Declaration (South Africa) and the 2025 BRICS Agriculture Declaration

(Brazil) prominently feature nature-based solutions, agroecology, and the bioeconomy. These frameworks challenge the dominant industrial farming regime by codifying the practices that reduce reliance on synthetic fertilisers, integrate traditional ecological knowledge, and promote circular agricultural economies. Through these declarations, the preservation of soil microbiomes and biodiversity is elevated from localised niche experiments into a formalised prerequisite for long-term global food security.

This ecological reconfiguration extends to the strategic diversification of global dietary and production regimes away from water-intensive staple crops toward climate-resilient alternatives. The promotion of Nutri-cereals, specifically millets, is well documented in the 2023 G20 declarations under India's presidency and subsequently supported within the BRICS frameworks. The 2023 G20 Meeting of Agricultural Chief Scientists (MACS) in Varanasi gave this innovation a formal institutional architecture by launching the MAHARISHI initiative (Millets and Other Ancient Grains International Research Initiative). By establishing its secretariat, the translation interface transformed millets from a localised dietary tradition into an international agricultural research priority, directly mitigating the landscape pressure of global water scarcity.

Biosecurity and Ecosystem Health: The One Health Architecture

The translation interfaces have also scaled systemic innovations in food safety and biosecurity to reconfigure global regulatory baselines. The G20 India 2023 Outcome Document institutionalised the One Health approach, a framework that integrates the governance of human, animal, plant, and ecosystem health to address compounding threats such as antimicrobial resistance (AMR) in food systems. The G20 endorsement of Codex Alimentarius guidelines on AMR surveillance signals an institutional mechanism that transitions biosecurity from a niche veterinary concern into a global regulatory standard.

Parallel reconfigurations are evident within the BRICS framework. The 2021 India Declaration specifically mandated increased investment in food safety and identified country-wise priority hazards, while the 2022 China Declaration committed the bloc to active participation in standard-setting bodies, including Codex Alimentarius, the International Plant Protection Convention (IPPC), and the World Organisation for Animal Health (WOAH). Rather than treating food safety as a barrier to trade, the BRICS interface uses these multilateral bodies to manage transboundary animal and plant diseases, adapting the macro-regime to handle ecological vulnerabilities without disrupting intra-bloc trade.

Digital Agriculture to Digital Public Infrastructure

The transition toward digital agriculture represents the most institutionally unified socio-technical reconfiguration across both forums. Contrary to literature characterising early BRICS technology engagement as focused on basic mechanisation, the 2011 Chengdu

Declaration already articulated an advanced agenda encompassing biotechnology, joint research laboratories, and the Strategic Alliance for Agricultural Research. This trajectory deepened over the decade; the 2016 New Delhi Declaration positioned information and communication technologies (ICT) as an enabler connecting smallholders to markets, while the 2017 Nanjing Declaration formally integrated smart agriculture, biotechnology, and nanotechnology into the bloc's programmatic goals. The G20 mirrored this trajectory in its 2019 Japan Declaration, which positioned artificial intelligence, the Internet of Things (IoT), and precision farming as essential sustainability enablers.

Within the 2019–2024 BRICS sequence, this digital shift transitioned from an aspirational niche into an operational regime standard. The 2019 Bonito Declaration introduced dedicated thematic sections on innovation in the communication sector, advocating for rural broadband expansion and IoT integration across production chains. The 2020 Russia Declaration expanded this to utilize ICT for food traceability, transboundary pest monitoring, and automated inspection systems under the Sanitary and Phytosanitary (SPS) Agreement. Crucially, the 2020 declaration raised a systemic caution absent from G20 texts, noting that asymmetric AI and large-scale data deployment could destabilise established market relationships to the detriment of smallholders.

By the time the 2021 India and 2022 China declarations endorsed the BRICS Agriculture Research Platform (BARP), digital tools had become embedded regime protocols. This transition reached full maturity during the 2023 G20 MACS under India's Presidency, which institutionalised the concept of Digital Public Infrastructure (DPI) tailored to smallholder farmers. The subsequent 2023 G20 Agriculture Ministers' Outcome Document in Hyderabad dedicated an entire thematic section to Digitalisation for Agricultural Transformation. While DPI offers precision optimisation to counter landscape climate pressures, it simultaneously introduces new socio-technical dependencies, including data sovereignty risks and increased energy footprints, suggesting that this regime adaptation may shift rather than eliminate systemic vulnerabilities.

Normative Transitions and Hard Institutionalisation

While traditional MLP scholarship is often critiqued for a techno-centric bias that overlooks practice-driven social innovations (Soh, Feitelson, and Berry, 2025), the empirical record reveals that these multilateral interfaces are actively driving normative transitions. Marsden (2024) utilises the Bio-physical, Innovation, Market, and Knowledge (BIMK) systems framework to explain how place-based practices drive macro transitions. BRICS operationalises these normative BIMK transitions by structurally embedding socio-economic protections for vulnerable populations into its bureaucratic instruments. For example, the Action Plan 2025–2028 mandates the creation of a Digital Registry for Family Farmers and formally aligns the bloc's architecture with the Global Alliance Against Hunger and Poverty. By treating family farmer empowerment as a core structural

mechanism rather than a peripheral niche, the interface actively alters the normative orientation of the dominant agricultural regime.

BRICS has also structurally institutionalised its knowledge and innovation transition through the BRICS Agricultural Research Platform (BARP). Initially conceptualised in 2015 and officially operationalised in 2021, BARP serves as a multilateral, virtual network designed to pool scientific expertise and facilitate technology transfer across member states. In the context of the Multi-Level Perspective, BARP functions as a dedicated institutional incubator for niche innovations, shielding and nurturing sustainable practices before they are deployed at the regime level. By institutionalising this collaborative research architecture, BRICS ensures that critical technological transitions (such as climate-resilient crop development and digital public infrastructure for smallholders) are systematically scaled and embedded into the global agricultural regime.

Finally, successful transitions require what Geels (2026) terms incumbent reorientation and hard institutionalisation, where established actors mobilise large-scale financial and organisational resources to alter regime architecture. Beyond rhetorical consensus, both forums are actively deploying capital to hardwire these reconfigurations. Within the BRICS framework, the Action Plan 2025–2028 explicitly directs the New Development Bank (NDB) to structure blended finance, green bonds, and public-private partnerships for the newly launched BRICS Partnership for Land Restoration and small-scale fisheries infrastructure.

This parallel financial mobilisation matches the established tracking mechanisms within the G20. The 2023 Stocktaking of G20 Initiatives demonstrates that the Platform for Agriculture Risk Management (PARM) has successfully moved regime investments into targeted project funding, allocating 12 million dollars in Ethiopia, 48.5 million dollars in Burkina Faso, 48.3 million dollars in Senegal, and 61 million dollars in Niger. Similarly, the Tropical Agriculture Platform (TAP) completed capacity development initiatives for agricultural innovation systems across El Salvador, Rwanda, and Cambodia, while satellite monitoring through GEOGLAM scaled from an experimental concept to an active regime defence tool, establishing an ad hoc working group to coordinate consensus analytical products with the Ukrainian Ministry of Agriculture. Together, these interventions demonstrate that the Multilateral Translation Interface actively deploys institutional and financial power to hardwire a reconfigured global agricultural regime.

5. Discussion: Translating Global Mandates to National Policy: The Case of India

The socio-technical transition from an industrial agricultural regime to a sustainable one requires national governments to actively operationalise the niche innovations identified in global forums. India presents a significant case study in this context. Having held the

G20 Presidency in 2023 and preparing to assume the BRICS chairmanship in 2026, India is positioned as a primary geopolitical bridge between the Global North and the Global South. An analysis of India's contemporary domestic agricultural schemes reveals a strategic alignment with the MLP transitions identified in the G20 and BRICS declarations. India is actively attempting to scale micro-level niches into national meso-level regime standards.

5.1 Domestic Operationalisation: India as a Translation Crucible for the Sustainability Transition

The interaction between global landscape pressures, multilateral mandates, and domestic agricultural policies is vividly demonstrated in the Indian context. As a prominent actor within both the G20 and the BRICS blocs, India functions as a primary translation crucible, converting international strategic declarations into binding national legislation and capital allocations. Rather than treating sustainability transitions as passive compliance with external norms, Indian policy indicates a calculated attempt to execute a socio-technical reconfiguration of its domestic agricultural architecture, balancing techno-centric optimisation with socio-ecological resilience as per the law of the land of member countries.

5.2 Operationalising Digital Public Infrastructure: Agristack and Regime Optimisation

The most prominent structural convergence between G20 mandates and Indian policy is the institutionalisation of Digital Public Infrastructure (DPI). The G20 Deccan High-Level Principles (2023) championed DPI as an essential mechanism for agricultural inclusion and market efficiency. Domestically, India is executing this transition through the Agristack initiative. By building a federated digital registry that integrates farmer identities via the PM-KISAN database, dynamic crop planning models, and digitised land records, India is transitioning precision agriculture from an isolated innovation into a foundational regime standard.

From the perspective of transition theory, this infrastructure allows the state to bypass inefficient, generalised input subsidies in favour of targeted, data-driven interventions. This direct application of data systems fulfils the regime optimisation and traceability goals frequently cited in G20 literature. However, as noted in the critical Multi-Level Perspective framework, this digital reconfiguration introduces new vulnerabilities regarding data sovereignty, algorithmic governance, and technological dependencies for smallholder farmers, reflecting the contested nature of techno-centric sustainability pathways.

5.3 Scaling Climate-Resilient Crop Regimes: The National Millet Mission

Addressing the compounding landscape pressures of climate change and acute water scarcity requires a structural shift in crop production regimes. During its 2023 G20 Presidency, India heavily promoted nutri-cereals, a diplomatic push that culminated in

the United Nations declaring 2023 the International Year of Millets. Domestically, this international mandate is operationalised through the Shree Anna, or National Millet Mission. By structurally prioritising and incentivising the cultivation of millets, which are drought-tolerant, require minimal synthetic inputs, and possess high nutritional density, India is attempting a deliberate regime reconfiguration. This policy seeks to dismantle the historical path dependency on water-intensive staples like rice and wheat, which remains a legacy of the 1960s Green Revolution, thereby securing domestic food sovereignty against climate shocks.

India's role in scaling this alternative crop architecture extends directly back to the multilateral level, reinforcing its position as a translation interface. The MAHARISHI Secretariat, established at the Indian Institute of Millets Research in Hyderabad via the G20 MACS 2023, institutionalises India as the global host for this research paradigm. This builds upon a long-term strategy: India's 2015 proposal at the Fifth BRICS Agriculture Ministers' Meeting to establish a BRICS Agriculture Research Centre (BARC), which subsequently evolved into the BRICS Agricultural Research Platform (BRICS-ARP), demonstrates how India consistently uses multilateral forums to anchor agricultural research institutions domestically while projecting technical influence within the Global South. The 2023 BRICS Declaration in South Africa explicitly recognised the platform's role in technology development, while the 2024 Moscow Declaration called for its further development to conduct joint research and exchange scientific personnel, effectively institutionalising a parallel knowledge network outside Western paradigms.

5.4 Socio-Ecological Reconfiguration: The National Mission on Natural Farming

Aligning with the BRICS declarations' consistent emphasis on traditional ecological knowledge and agroecology, documented from 2019 through the 2024 Moscow Declaration, India has launched the National Mission on Natural Farming (NMNF). The 2024 Moscow Declaration's explicit call for circular economies, sustainable intensification, bioeconomy, and agroecology directly mirrors India's domestic policy shift. The NMNF acts as an institutionalised space for agroecological practices, seeking to scale non-chemical farming methods to reduce national reliance on imported, carbon-intensive chemical fertilisers. This represents a distinct social-ecological pathway within India's transition strategy, prioritising low-input sovereignty and smallholder protection in accordance with the normative goals articulated by the BRICS bloc.

5.5 Post-Harvest Capitalisation and Food Loss Mitigation

To address the regime adaptation goal of minimising Food Loss and Waste (FLW) championed by the G20, India established the Agriculture Infrastructure Fund (AIF). This financing facility provides medium to long-term debt financing for post-harvest management infrastructure, cold storage networks, and decentralised community farming assets. The deployment of the AIF illustrates that transitioning the macro agricultural regime requires more than agroecological or digital innovations; it demands substantial,

targeted meso-level capital investment to alter physical supply chains. By optimising mid-stream logistics, the fund directly serves the regime's sustainability goals of resource efficiency and emission reduction, demonstrating how domestic financial mobilisation hardwires international transition frameworks.

5.6 Future Directions for Multilateral Forums to Advance Sustainability Transition

Moving forward, a primary direction for the BRICS and G20 agricultural agenda is the structural shift from input-intensive commercial farming toward nature-based solutions and regenerative agriculture. Recognising that smallholder farmers face compounding vulnerabilities from climate stress and resource degradation, recent multilateral negotiations emphasise the need to scale low-input, farmer-centric agricultural solutions. Furthermore, this transition will increasingly integrate the preservation of traditional indigenous crops and Globally Important Agricultural Heritage Systems (GIAHS), embedding traditional ecological knowledge as a formal pillar of global climate resilience.

A second crucial direction involves the maturation of BRICS' parallel institutional architectures, transitioning them from exploratory platforms into hard regime-stabilisation mechanisms. In terms of trade, the bloc is actively pursuing the implementation of the "BRICS Grain Exchange," an initiative introduced in 2024 to create an internal trading platform for agricultural commodities. The 2025–2028 Action Plan commits to operationalising this by developing secure, transparent payment systems and independent trade settlement infrastructures, thereby insulating member states from global supply chain disruptions and external macroeconomic shocks. Simultaneously, the BRICS Agricultural Research Platform (BARP) is slated for significant evolution. By fostering cross-border innovation hubs and blended finance, BRICS intends to rapidly scale climate-resilient technologies and improve market access for farmers across the Global South.

5.7 Endogeneity, Causality, and Asymmetric Implementation Capacity

While the alignment between international declarations and domestic policies is evident, one important analytical caveat must be acknowledged regarding the direction of causality. It is methodologically challenging to confirm whether domestic initiatives like the Agri Stack or the National Millet Mission are direct results of the normative narratives established by multilateral forums, or the other way around. Powerful member states actively use platforms like the G20 and BRICS as geopolitical translation interfaces to push their own domestic agendas and institutionalise their preferred agricultural practices into global declarations. The establishment of the MAHARISHI secretariat in Hyderabad or the integration of family farming frameworks into BRICS declarations suggests that multilateral consensus is frequently an aggregation of domestic policy successes pushed upward by dominant nation-states, rather than a top-down mandate.

Furthermore, the capacity to operationalise these reconfigured regime standards is highly asymmetric across global economies. Even when the G20 or BRICS achieve rhetorical

consensus on advanced frameworks like Digital Public Infrastructure or the One Health architecture, individual member nations differ drastically in their fiscal capacity, institutional infrastructure, and state capacity to execute these transitions. Consequently, the global sustainability transition remains uneven, as diverse national contexts and localised path dependencies determine whether an international mandate is translated into domestic reform (or policy) or remains confined to diplomatic and political narrative.

6. Conclusion

This study mapped the evolving architecture of global agricultural governance by conducting a longitudinal thematic content analysis of G20 and BRICS agricultural declarations from 2010 through 2024. Using a modified Multi-Level Perspective framework, the objective was to analyse how these multilateral forums function as translation interfaces that absorb macro-level landscape pressures and translate them into meso-level structural or policy responses to govern the global sustainability transition.

The analysis yielded two primary findings regarding global agri-food transitions:

- **Evolving Landscape Pressures:** Macro-level landscape pressures have shifted from early production-centric concerns regarding demographic expansion and market price volatility toward systemic, poly-crisis driven by climate change, biodiversity loss, and the explicit use of food and fertiliser supply chains as instruments of geopolitical pressure.
- **Divergent Pathways to Sustainability:** The two forums approach the sustainability transition through different ideological pathways. The G20 focuses primarily on technological optimisation, emphasising capital-intensive innovations, digital tools, and market efficiency. Conversely, the BRICS bloc emphasises social and ecological reconfiguration, structurally placing smallholders, family farmers, and agroecology at the centre of its transition strategy.

The formal integration of the climate-food nexus and advanced biotechnology cooperation into both forums as early as 2011 demonstrates that the sustainability transition has a longer, more structurally embedded trajectory than previously theorized. As evidenced by India's domestic implementation of Agristack and the National Millet Mission, the translation of international mandates requires sovereign states to actively reconfigure their domestic regimes to break path dependencies. Ultimately, these findings indicate that the global agricultural food system operates as an interconnected macro regime where the sustainability transition is not a unified technical shift, but a deeply contested structural reconfiguration negotiated across competing techno-centric and social-ecological pathways.

While this study captures the stated policy intentions of the world's major economies, its primary limitation is its reliance on high-level political texts, which often obscure the slower, more complex ground-level implementation. The capacity of multilateral forums to act as translation interfaces is limited when the landscape shocks are geopolitical rather than strictly

ecological. For instance, the G20's consensus broke down over the war in Ukraine, with Russia explicitly dissociating itself from paragraphs condemning the aggression and China formally stating that the meeting outcome should not include any reference to the Ukraine crisis. Furthermore, compounding geopolitical uncertainties further paralyse multilateral coordination. In response to these heightened geopolitical tensions, nations increasingly resort to unilateral policy measures and coercive trade restrictions that fragment global supply chains and undermine food security, a trend explicitly condemned in the 2024 BRICS Moscow Declaration. When the global translation interface becomes paralysed by such geopolitical landscape shocks, actors may retreat to smaller, bloc-level interfaces to maintain regime stability; this is exemplified by the recent Russian initiative to create the BRICS Grain Exchange to strengthen trade relations within the BRICS framework. A further constraint is that the dataset necessarily reflects the negotiated, consensus-driven language of multilateral diplomacy; dissenting positions, internal disagreements, and unresolved tensions are usually absent from formal declarations.

Future research should undertake empirical, quantitative assessments of how multilateral commitments regarding agricultural digitalisation and climate finance are actively disbursed and utilised by smallholder farmers in emerging economies. The analytical comparison between AMIS and BAIES warrants dedicated investigation: both are regime-level information tools, but their operational design, funding models, data quality, and real-world influence on market behaviour remain understudied. The expansion of BRICS from five to eleven members in 2024 also creates a significant new research question: whether the bloc's agricultural governance cohesion, built on the shared interests of Brazil, Russia, India, China, and South Africa, can be sustained as membership diversifies to include states with very different agricultural profiles. Future work should also assess whether the MAHARISHI initiative has translated into measurable changes in millet research investment and cultivation patterns across G20 member states, and whether the BRICS Grain Exchange, proposed in 2024, develops into a functioning alternative to existing commodity trading platforms.

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Appendix A: Thematic Audit Trail

Table A1 below provides the comprehensive thematic audit trail linking final analytical themes to verbatim textual evidence from the dataset.

Table A1: Thematic Audit Trail with Verbatim Evidence

MLP Level	Sub-Theme	Representative Verbatim Evidence	Source Document
1. Landscape Pressures	1.1 Market Volatility & Population	"Food price volatility poses serious challenges for agricultural development and food security."	2011 G20 Action Plan (France)
1. Landscape Pressures	1.1 Market Volatility & Population	"BRICS countries collectively represent 43% of world population and 18% of global trade..."	2011 BRICS Chengdu Declaration
1. Landscape Pressures	1.2 Climate & Biodiversity Crises	"Climate change challenges us to rethink our food and agricultural systems."	2017 G20 Agriculture Declaration (Germany)
1. Landscape Pressures	1.2 Climate & Biodiversity Crises	"We recognize the triple challenge of ensuring food security, adapting to climate change, and reducing greenhouse gas emissions."	2011 BRICS Chengdu Declaration
1. Landscape Pressures	1.3 Systemic Shocks (Pandemic/Geopolitical)	"The COVID-19 pandemic has exposed the fragility of our food systems."	2020 G20 Saudi Arabia Declaration
1. Landscape Pressures	1.3 Systemic Shocks (Pandemic/Geopolitical)	"...the war in Ukraine...is causing significant disruptions to global food and energy markets."	2022 G20 Chair's Summary (Indonesia)
2. Regime Adaptation	2.1 Trade Rules & Market Transparency	"We reaffirm our commitment to open, transparent, inclusive, predictable, and non-discriminatory multilateral trading systems consistent with WTO rules."	2018 G20 Agriculture Declaration (Argentina)
2. Regime Adaptation	2.1 Trade Rules & Market Transparency	"The Basic Agricultural Information Exchange System (BAIES) was officially launched. The online version of the BAIES will be developed to provide online information sharing."	2017 BRICS Nanjing Declaration
2. Regime Adaptation	2.2 Food Loss & Waste (FLW)	"Investment at all stages of food value chains is fundamental to raising productivity, generating employment and incomes and reducing food loss and waste."	2015 G20 Agriculture Declaration (Turkey)
2. Regime Adaptation	2.2 Food Loss & Waste (FLW)	"We renew our commitment to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses by 2030."	2021 G20 Matera Declaration (Italy)
2. Regime Adaptation	2.2 Food Loss & Waste (FLW)	"In order to achieve SDG12.3, we commit to prioritize reduction in food loss and waste. A substantial share of food production is lost with significant economic, social and environmental implications..."	2023 G20 Chair's Summary (India)

MLP Level	Sub-Theme	Representative Verbatim Evidence	Source Document
2. Regime Adaptation	2.3 Subsidies & Livelihood Protection	"...agreed on broad contours of quadrilateral cooperation in the agricultural sector with particular attention to family farming, the development of which will not only help long-term interests of the four states but contribute towards global food security."	2010 BRICS Moscow Declaration
2. Regime Adaptation	2.3 Subsidies & Livelihood Protection	"We emphasize the need to reform global agricultural trade rules and address the historical imbalances in agricultural subsidies that disproportionately affect developing nations."	2023 BRICS Joint Declaration (South Africa)
2. Regime Adaptation	2.3 Subsidies & Livelihood Protection	"...we support further discussions on policies that enhance food availability, accessibility, utilization, stability and affordability... we acknowledge the relevance of strategic food reserves, investments in storage, and encourage implementing other policy instruments (e.g. minimum price support...)"	2025 BRICS AWG Joint Declaration
3. Niche Innovation	3.1 Digitalization & Agri-Tech	"We recognize the importance of deploying information and communication technology (ICT) in agriculture, as it creates an enabling environment to connect the farmers to inputs, technologies, financial services and markets..."	2016 BRICS New Delhi Declaration
3. Niche Innovation	3.1 Digitalization & Agri-Tech	"We highlight the importance of encouraging innovation in agriculture, inter alia, through the utilization and access of advanced technologies, such as Information and Communication Technology (ICT), Artificial Intelligence (AI) and robotics among others..."	2019 G20 Agriculture Declaration (Japan)
3. Niche Innovation	3.1 Digitalization & Agri-Tech	"Digitalization in agriculture supported by appropriate digital infrastructure has the potential to transform the sector and help governments and other stakeholders to address the current food, environmental, and socio-economic challenges."	2023 G20 Chair's Summary (India)
3. Niche Innovation	3.2 Agroecology & Climate-Smart Ag	"We emphasize the importance of developing and enhancing actions at different levels, including appropriate frameworks, to stimulate national policies to promote soil health, soil carbon sequestration, degraded soil restoration and use of soils in a sustainable manner."	2018 G20 Agriculture Declaration (Argentina)
3. Niche Innovation	3.2 Agroecology & Climate-Smart Ag	"We emphasize the need to create an enabling environment for transformation towards climate-resilient, sustainable agriculture and food systems by supporting policies to promote innovation..."	2023 G20 Chair's Summary (India)

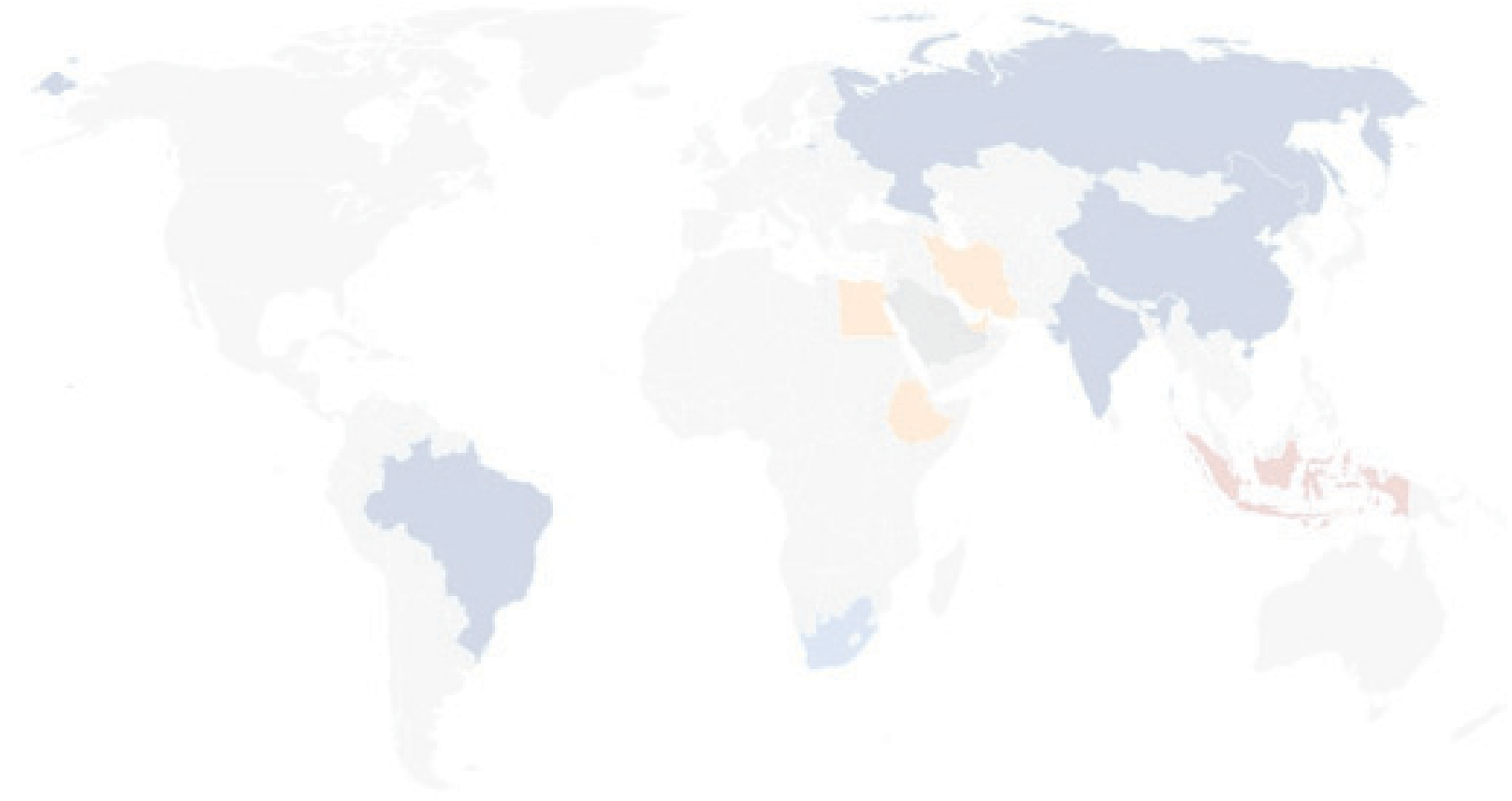
MLP Level	Sub-Theme	Representative Verbatim Evidence	Source Document
3. Niche Innovation	3.2 Agroecology & Climate-Smart Ag	"We will also promote environmentally friendly, efficient and inclusive agricultural practices, particularly the sustainable intensification of agriculture, aquaculture, and fisheries, including through organic farming and agroecology."	2025 BRICS AWG Joint Declaration
3. Niche Innovation	3.3 Nutritional Diversification	"We further welcome the declaration of the year 2016 as the International Year of Pulses by the United Nations General Assembly and endeavour to promote the value of pulses throughout the food system..."	2016 BRICS New Delhi Declaration
3. Niche Innovation	3.3 Nutritional Diversification	"We encourage initiatives to promote innovations in crop development, production and consumption patterns including climate-resilient, nutritious, locally adapted, Indigenous and underutilized grains."	2023 G20 Chair's Summary (India)
3. Niche Innovation	3.3 Nutritional Diversification	"...support the launch of the 'Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI)' to facilitate research collaboration on climate resilient and nutritious grains including Millets and other underutilized grains."	2023 G20 MACS (India)

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