

Green Finance Strategies for Climate-Smart Agriculture in the G20 Countries

¹G. G. Pawar, ²S. R. Mujawar

¹Assistant Professor, Dept. of Economics, Chhatrapati Shivaji College – A constituent college of Karmaveer Bhaurao Patil University, Satara

²Assistant Professor, Department of Economics, Yashwantrao Chavan (KMC) College, Kolhapur – 416004.

Article Info	ABSTRACT
Article History: Received: 15th Dec 2025 Accepted: 18th Dec 2025 Published: 20th Dec 2025 Keywords: <i>Green Finance, Climate-Smart Agriculture (CSA), G20, Sustainable Finance, Climate-Risk Disclosure, Blended Finance, Food Security, Agricultural Policy</i>	Climate-Smart Agriculture (CSA) is critical for ensuring global food security and achieving climate goals, yet the sector faces a persistent challenge in mobilizing adequate finance, particularly from private sources. This research paper explores the current state of green finance strategies adopted by G20 countries to accelerate the adoption of CSA practices. Leveraging secondary data from policy reports, academic literature, and international organization databases, the paper analyzes the policy frameworks, financial instruments, and investment trends across G20 members. Findings indicate a growing, but fragmented, landscape of green finance initiatives, primarily driven by national development banks and public budgetary allocations, with a significant gap in attracting private sector capital at the scale required for a comprehensive agricultural transition. The research highlights the need for harmonized green finance taxonomies, stronger climate-risk disclosure standards, and innovative blended finance models tailored to the specific risk-return profiles of agricultural investments. Strategic policy recommendations are proposed to enhance G20 cooperation, streamline access to international climate funds, and foster a more robust ecosystem for private investment in climate-resilient food systems.
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Introduction:

The Group of Twenty (G20) nations collectively represent approximately 80% of the world's Gross Domestic Product, two-thirds of the global population, and a significant portion of global greenhouse gas (GHG) emissions. Consequently, the policies and financial decisions of these countries are paramount to the success of global climate action and sustainable development agendas. Agriculture, which is both a major contributor to and a primary victim of climate change, stands at the nexus of these challenges. Climate-Smart Agriculture (CSA), defined by the Food and Agriculture Organization (FAO) as an approach that sustainably increases productivity and incomes, adapts and builds resilience to climate change, and reduces and/or removes GHG emissions, is essential for ensuring food security in the face of escalating climate risks (Wavare & Pawar, 2025).

The transition to CSA is inherently capital-intensive, requiring substantial upfront investments in new technologies, infrastructure, and capacity building. The financial gap for this transition, particularly in emerging market and developing economies within the G20, is enormous (Jadhav et al., 2025). Green finance, encompassing all forms of investment or lending that consider environmental effect and enhance environmental sustainability, has emerged as a crucial lever to bridge this gap by aligning financial flows with climate and sustainability objectives (Pawar et al., 2022). Since the establishment of the Green Finance Study Group (GFSG) in 2016, the G20 has consistently focused on mainstreaming green finance, but efforts specifically targeting the nuanced requirements of the agriculture sector require deeper analysis and more concrete implementation strategies (Wavare & Pawar, 2022). This paper seeks to analyze the effectiveness of G20 green finance strategies in mobilizing the necessary public and private capital for a climate-smart agricultural transition.

Review of Literature:

The concept of green finance, as extensively reviewed in the literature, is pivotal for channeling funds towards climate mitigation and adaptation projects (Bhave et al., 2022). Global efforts, particularly those by the G20 Sustainable Finance Working Group (SFWG), have focused on promoting the standardization of practices, enhancing transparency through disclosure standards for environmental risks, and supporting market development for green financial assets (Harale & Pawar, 2025). The G20 Sustainable Finance Roadmap, endorsed in 2021, represents a multi-year effort to scale up private and public sustainable finance (Pawar, 2023).

Despite this progress, literature consistently points to a significant shortfall in climate finance directed towards the agriculture and land use sector (Kamat & Pawar, 2024). Global financial flows to climate action have seen a surge, yet the investment required for climate-smart infrastructure in energy, transport, and water across G20 countries is estimated to be in the tens of trillions of US dollars over the next decade and a half. Specifically, investment in Nature-based Solutions (NbS), which directly encompasses many CSA practices like sustainable soil

management and agroforestry, shows a similar gap. In 2020, G20 countries invested an estimated USD 120 billion in NbS, but the annual investment needs to increase by 140% to achieve climate and biodiversity targets by 2050. The vast majority of this G20 spending (87%, or USD 105 billion) is allocated to domestic government programs, with private sector investment remaining a small fraction at 11% (USD 14 billion), highlighting the challenge in leveraging private capital (Wavare et al., 2024).

Specific literature on national efforts, such as in India, emphasizes the need for a comprehensive sustainable agriculture taxonomy to establish clear standards and enable better tracking of financial flows. Other studies highlight the complexity of the existing climate finance architecture, which presents fragmented and time-consuming pathways for developing countries, often leading to insufficient and poorly managed funds for critical sectors like agriculture. The literature clearly establishes the role of green finance instruments like green bonds and green loans in the broader sustainable finance landscape, but their application and scaling in the agricultural context remain constrained by factors like information asymmetry, inconsistent definitions, and the perception of high risks and lower returns in agriculture compared to other sectors.

Objectives:

The primary objectives of this research paper are:

1. To analyze the existing green finance strategies and policies implemented by G20 countries aimed at mobilizing capital for Climate-Smart Agriculture.
2. To identify the key financial instruments and mechanisms utilized by G20 members, including public and private sources, for funding the transition to CSA.
3. To assess the common barriers and challenges hindering the effective flow of green finance to the agriculture sector across the G20.
4. To propose concrete policy suggestions for the G20 to strengthen the green finance ecosystem and accelerate private sector investment in CSA.

Research Methodology:

This research paper adopts an analytical and descriptive approach based entirely on secondary data and documented literature. The methodology relies on a comprehensive review and synthesis of publicly available information, including:

1. **Policy Documents and Official Reports:** Documents published by the G20 SFWG, the Financial Stability Board (FSB), the OECD, and official reports from international bodies such as the World Bank, FAO, and UNEP.
2. **Academic and Scholarly Literature:** Peer-reviewed articles and research papers on green finance, climate-smart agriculture, and sustainable development finance in the context of G20 economies.

3. **National Regulatory and Disclosure Documents:** Selected policy initiatives, green finance roadmaps, and regulatory requirements related to sustainable lending/investing from key G20 member countries (e.g., Brazil, China, India, France, South Africa, and the UK).

The collected data is qualitatively analyzed to identify patterns, common strategies, challenges, and best practices in green finance for CSA across the diverse G20 members. This comparative analysis focuses on drawing generalized findings and formulating policy suggestions relevant to the G20 collective.

Data Analysis and Interpretation:

The analysis of secondary data reveals a dual landscape for green finance strategies within the G20: a strong commitment to general sustainable finance frameworks, yet a nascent and often indirect approach to funding CSA.

1. **Policy Frameworks and Standardization:** G20 countries have made significant strides in establishing national and regional green finance roadmaps and taxonomies. For instance, China has been a pioneer in introducing green bond standards, while the European Union (a G20 member) has developed a comprehensive taxonomy that influences global standards. However, the analysis shows that the integration of CSA-specific activities into these high-level frameworks remains inconsistent. Many taxonomies are heavily focused on energy and transport, with agriculture-related activities often falling under broad categories like 'land use' or 'nature-based solutions'. This lack of a standardized, granular taxonomy for CSA across G20 members creates ambiguity, complicates the labeling and issuance of 'green' agricultural assets, and contributes to the problem of greenwashing.
2. **Financial Flows and Instruments:** The data strongly suggests that the mobilization of finance for sustainable land use and nature-based solutions - the closest proxy for CSA investment - is overwhelmingly dominated by public finance. The vast majority of the USD 120 billion invested by the G20 in NbS in 2020 came from domestic government programs. This dependence on budgetary allocations limits the scalability of CSA. Examples of public-sector-led initiatives include the Reserve Bank of India's inclusion of small renewable energy projects in Priority Sector Lending, which encourages bank credit to the agricultural sector, and Brazil's regulatory requirements for banks to monitor environmental risks.
3. The use of market-based instruments like green bonds for agriculture is limited, primarily because the perceived risks and lower, less predictable returns associated with farming projects do not align with the expectations of large institutional investors. Blended finance models, which use concessional public funds to de-risk private investment, are recognized as a key tool but their deployment and scale-up for agricultural projects in the G20, especially those involving smallholders, is still inadequate. The fragmentation of international climate funds and their

complex accreditation processes further limits the access of developing G20 economies to necessary capital for CSA adaptation projects.

4. **Transparency and Risk Disclosure:** There is a growing global trend, supported by the G20, to enhance the transparency of information through mandatory disclosure standards for carbon and environmental risks. The Financial Stability Board (FSB) review, mandated by G20 Finance Ministers, highlights the financial impacts of climate change and the need for greater disclosure. However, the implementation of such standards, particularly related to the specific physical and transition risks in the agricultural supply chain, is uneven across G20 members. Without robust, mandatory, and sector-specific disclosure from corporations and financial institutions on their nature- and climate-related agricultural exposures, the asymmetric information problem persists, deterring private capital from flowing into CSA which is perceived as a high-risk sector.

Major Findings:

The research yields four central findings regarding Green Finance Strategies for CSA in the G20:

1. **Taxonomy and Definitional Gap:** A critical gap exists in the absence of a unified, granular G20-level or universally endorsed national green finance taxonomy that clearly defines and categorizes Climate-Smart Agriculture activities. This ambiguity prevents the effective measurement, tracking, and channeling of finance to the sector.
2. **Public Finance Over-Reliance:** The current financial landscape for CSA is heavily dependent on public budgetary resources and national development bank lending, primarily for domestic programs. Private capital mobilization, which is essential for achieving the required scale of transition, remains minimal and is largely focused on improving supply chain sustainability rather than core on-farm CSA adoption.
3. **Underutilized Blended Finance:** Despite its theoretical potential, Blended Finance is significantly underutilized to de-risk and attract commercial finance to CSA projects. The complexity, high transaction costs, and lack of specialized intermediaries for small-scale agricultural investments limit the effectiveness of this mechanism.
4. **Inadequate Climate-Risk Integration:** While G20 is addressing climate-related financial risk (physical and transition), the application of disclosure standards to the agricultural sector is lagging. The lack of standardized, granular reporting on agricultural climate risk exposures by major corporate and financial actors obscures the opportunities for resilient, climate-smart investments, perpetuating the high-risk perception.

Policy Suggestions:

To address the limitations and accelerate the financing of Climate-Smart Agriculture, the G20 should consider the following policy suggestions:

1. **Develop a G20-Aligned CSA Finance Taxonomy:** The G20 Sustainable Finance Working Group should prioritize the development of a voluntary, high-level framework for a common

green finance taxonomy specifically for agriculture. This taxonomy must clearly define eligible CSA practices and metrics (e.g., sustainable water management, agroforestry, reduced fertilizer use) to harmonize green labeling, enable the issuance of agricultural green bonds, and prevent greenwashing.

- 2. Mandate Sector-Specific Climate-Risk Disclosure:** G20 members should strengthen and make mandatory the disclosure of nature- and climate-related financial risks in the agriculture supply chain. This should align with global standards (e.g., Task Force on Climate-related Financial Disclosures - TCFD, and Task Force on Nature-related Financial Disclosures - TNFD), requiring large agribusinesses and financial institutions to report on their exposure to agricultural physical risks and transition risks. This transparency would help re-price risk and incentivize investment in resilient CSA projects.
- 3. Catalyze Blended Finance for Smallholders:** G20 Development Finance Institutions (DFIs) and Multilateral Development Banks (MDBs) must significantly scale up the use of blended finance instruments - such as first-loss guarantees, concessional debt, and technical assistance funds - to specifically de-risk investments in smallholder CSA adoption. The focus should be on establishing dedicated, specialized intermediaries and regional challenge funds to lower transaction costs and aggregate small projects into investment-ready portfolios.
- 4. Repurpose Agricultural Subsidies and Incentivize Green Banking:** G20 governments should review and gradually repurpose environmentally harmful agricultural subsidies towards payment-for-ecosystem-services schemes and direct financial incentives for CSA adoption. Additionally, central banks and regulators in the G20 should encourage "Green Banking" by adjusting capital requirements or providing refinancing schemes for commercial banks to increase lending for verified CSA practices.

Conclusion:

The transition to Climate-Smart Agriculture is an existential imperative for G20 nations, essential for achieving both climate stability and food security goals. While G20 members have successfully built foundational frameworks for green finance, the translation of these high-level commitments into impactful finance flows for the agriculture sector remains a work in progress. The current strategies are fragmented, overly reliant on public funds, and hindered by a lack of granular policy tools, such as a dedicated CSA taxonomy and effective risk-pricing mechanisms. To move beyond symbolic progress and achieve the necessary scale, the G20 must champion policy coherence, prioritize the standardization of CSA finance definitions, leverage blended finance strategically to unlock private capital, and enforce robust, sector-specific climate-risk disclosure. By acting decisively on these strategies, the G20 can catalyze a resilient, sustainable, and climate-smart future for global agriculture.

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