Sustainable Finance Flows to India's Agriculture Sector

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CPI is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has seven offices around the world in Brazil, India, Indonesia, South Africa, the United Kingdom, and the United States.

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EXECUTIVE SUMMARY

India's agriculture sector faces a multifaceted "Grand Challenge:" Ensuring food security for a growing population, supporting rural livelihoods, and managing the adverse impacts of climate change, all while contending with limited resources, financial constraints, and the need to reduce greenhouse gas emissions. Addressing these challenges necessitates a transition toward sustainable agriculture.

This report introduces a comprehensive sustainable agriculture framework developed using a value-chain approach to analyze relevant sectors, activities, policies, and key initiatives. It provides a detailed examination of financial flows in the agriculture sector during FY[1] 2020–21 and FY 2021-22, offering insights into public and private finance sources, intermediaries, and end-use activities across the entire agriculture value chain.

By mapping financial flows and highlighting investment opportunities, this report serves as a roadmap for stakeholders—including policymakers, regulators, and private investors—to transform challenges into opportunities. It aims to inspire collaborative efforts, from public-private partnerships to intergovernmental and intragovernmental initiatives, to mobilize finance and advance sustainable practices in India's agricultural landscape.

KEY FINDINGS

Overall financial flows slightly declined amid growing agricultural needs: Annual financial flows to sustainable agriculture averaged INR 22,393 billion (USD 301 billion) for FY 2020-22. This was characterized by a 1.1% decline from INR 22,474 billion (USD 303 billion) in FY 2020-21 to INR 22,312 billion (USD 299 billion) in FY 2021-22. However, India's food demand is likely to increase to around 400 million tonnes by 2050 (Indian Agricultural Research Institute 2013), while production levels in FY 2022-23 were around 330 million tonnes (PIB 2023), translating to a five-year average growth requirement of approximately 4%.

Private financing via commercial financial institutions (FIs) took the lead: Private finance accounts for 67% of the total finance flows during FY 2020-21 and FY 2021-22 and increased 11.4% over this period, averaging INR 15,054 billion (USD 202 billion). Commercial FIs led the bulk of disbursements (99.5%) through loans primarily due to the Reserve Bank of India's (RBI's) priority-sector lending guidelines that mandate banks and other FIs to have 18% of their adjusted net bank credit or credit equivalent of off-balance sheet exposures in credit for agriculture and allied activities. During this two-year period, the total agriculture credit disbursed by FIs in India amounted to INR 34,387 billion (USD 462 billion), averaging INR 17,194 billion (USD 231 billion) each year (Department of Agriculture and Farmers Welfare 2023).

Domestic sources far outweighed international: Domestic sources represented 99.5% of flows (INR 22,289 billion), with international sources contributing only 0.5% (INR 105 billion). This stark disparity reflects global trends, where Official Development Assistance (ODA) for agriculture is limited and fragmented, representing just 5.2% of total ODA globally as of 2018 (Bharali et al. 2021). This highlights the challenge of mobilizing international support to

1 India's financial year (FY) runs from 1 April to 31 March of the following year.

complement domestic resources and to further unlock value through capacity building, technical assistance, and other mechanisms for the development of sustainable agriculture in India.

Government budgets are supporting sustainability in the agriculture sector: Union and state governments in India allocated an annual average of INR 7,294 billion (USD 98 billion) to agriculture during FY 2020-21 and FY 2021-22 (RBI 2023), of which INR 6,373 billion (USD 86 billion) went to the sustainable agriculture activities tracked by this study, mainly upstream and downstream activities.

RECOMMENDATIONS

India's sustainable agriculture finance ecosystem faces challenges related to skewed funding patterns, limited international flows, and underrepresentation of key financial actors including DFIs, philanthropies, and private equity / venture capital (PE/VC) investors. This report highlights four pillars of opportunity for improving financial flows to foster sustainable agriculture in India:

1. Sustainable agriculture tagging

The creation of a comprehensive taxonomy for sustainable agriculture is critical for establishing clear standards, driving innovation, and aligning practices with climate challenges. Integrating this effort with ongoing climate finance taxonomy codification will create a unified framework that supports regulatory, financial, and policy objectives. This effort should be led by government bodies, supported by FIs and regulators like the National Bank for Agriculture and Rural Development (NABARD) and RBI. Such a taxonomy would not only result in increased financial flows but also allow for better tracking of flows to subsectors, thereby enabling the identification of relevant interventions.

2. Enhancing monitoring and reporting systems

Strengthening monitoring and reporting systems is vital for improving transparency and closing data gaps in sustainable agriculture finance. A granular, technology-driven framework will enhance financial disclosures, enable risk assessments, and support data-driven decisions. Establishing digital platforms that monitor crop yields, soil health, and weather patterns will improve financial access and formalize the agricultural fintech sector. Stakeholders including FIs, government agencies, and fintech providers should lead this initiative, leveraging real-time data to advance climate-smart agriculture. This, combined with the development of a taxonomy, will ensure a unified reporting system, thereby eliminating current confusion around the definition of different terms.

3. Boosting and diversifying financial flows in underrepresented sectors

India's sustainable agriculture finance landscape requires a diversification of funding sources and expansion of instruments to address inadequately financed areas and reduce reliance on debt and government budgetary expenditure, which currently account for the majority of flows. Strengthening credit-risk mitigation through refinancing programs, weather-indexed insurance, and leasing models for sustainable equipment can de-risk agriculture financing and attract new investments. Furthermore, blended finance supported by DFIs, philanthropies, and PE/VC can unlock affordable funding for agritech solutions and pilot projects, accelerating the adoption of

climate-resilient practices. The need is not only for diverse types of flows but also for increased flows to sectors that currently receive comparatively low funding.

4. Capacity building for sustainable agriculture

Capacity building is essential to support the systemic adoption of sustainable agriculture practices across stakeholders. Expanding awareness initiatives and training programs will equip farmers and institutions with the knowledge to adopt climate-smart techniques. Additionally, policymakers, regulators, and FIs require training to assess risks and opportunities effectively. Collaborative efforts by government bodies, DFIs, NGOs, and philanthropic organizations can scale these initiatives, creating a knowledge ecosystem for sustainable agriculture in India.

These four pillars provide a **holistic framework** to strengthen India's sustainable agriculture finance ecosystem. They aim to address India's food security needs, reduce agricultural emissions, and strengthen resilience to climate change, creating a more sustainable and inclusive future for India's agriculture sector. The table below presents a summary of these pillars with specific key actions.

Table ES1: Four pillars and key actions for enhancing sustainable agriculture finance

Key Pillars	Rationale	Stakeholders	Key Actions
Sustainable agriculture tagging	Establish standards for sustainable practices, support evaluation and innovation, and align with climate finance taxonomy efforts.	FIs, Union government and regulators	• Create a **comprehensive sustainable agriculture taxonomy** encompassing different agricultural activities, geographical conditions, and climate risks.
Monitoring and reporting systems for comprehensive and granular data	Fill data gaps, enhance financial oversight, improve decision-making, and support agricultural fintech formalization.	FIs, government agencies, DFIs and fintech providers	• Promote **digital platforms that provide real-time data** on crop yields, weather patterns, and soil health. • Use technology to provide **agrometeorological advisory services** to help farmers make informed decisions.
Boosting and diversifying financial flows in lagging sectors	Address scarcely funded areas, reduce reliance on debt and government budgets.	Union and state government, DFIs, philanthropies, and private investors	• Promote a **value-chain financing model** that integrates various stakeholders. • Enhance **credit risk-mitigation structures** for agriculture financiers through refinancing and guarantee programs. • Expand the use of **innovative financial instruments and blended finance products**. • Enhance **government grants and other budgetary support** for sustainable agriculture research can unlock future value.
Capacity building for sustainable agriculture	Bridge knowledge gaps, enhance adoption of sustainable practices, and support localized programs aligned with regional needs.	Union and state governments, DFIs, NGOs, and philanthropic organizations	• **Expand digital resources**, including mobile-accessible training in sustainable agriculture. • Develop **training and capacity building** for all stakeholders in the sustainable agriculture finance ecosystem to better understand associated risks and opportunities.

CONTENTS

1. INTRODUCTION

1.1 CONTEXT

Increased finance will be critical for transitioning India's agriculture sector to sustainable practices that ensure food security and enhance climate resilience while also reducing greenhouse gas (GHG) emissions. India's current landscape of sustainable agriculture finance faces a lack of clarity over the roles of public and private stakeholders, the quantum of current financial flows, the efficiency of different financial mechanisms, and which beneficiary sectors/activities of the agriculture value chain are critical for achieving sustainable agriculture.

India is experiencing the "Grand Challenge"(Robertson & Swinton 2005) of managing agriculture-climate codependency, necessitating a transition to sustainable practices. The adverse impacts of climate change on agriculture affect livelihoods and food security. It is estimated that India's food demand is likely to increase to around 400 million tonnes by 2050 (Indian Agricultural Research Institute 2013), while production levels in FY 2022-23[2] were around 330 million tonnes (PIB 2023), translating to a five-year average growth requirement of approximately 4%. In FY 2022-23, the average growth of rice, wheat, and pulse production in the previous five years was 12.76%, 4.56%, and 5.68%, respectively (PIB 2024), presenting a promising outlook. However, crop simulation models predict that climate change will reduce yields of rainfed rice by 20% and irrigated rice by 3.5% by 2050, with a decline in wheat yield of 19.3% (Ministry of Agriculture and Farmer's Welfare 2023). Temperature rises, shifts in rainfall patterns, and increased intensity and frequency of extreme weather events are impacting water availability, soil health, and pest populations, which are expected to exacerbate food shortages and nutrient deficiencies (Datta et al. 2022). In addition, agriculture is the second-highest emitting sector in India, producing 18% of the country's gross GHG emissions, according to India's 3rd Biennial Update Report (BUR)(Indian Network for Climate Change Assessment 2010).[3]

India is an agrarian economy, with about 45.5% of its workforce engaged in agriculture and related activities (PIB 2023e). Furthermore, 92.02% of the total agricultural sector employment is in rural areas (MoSPI 2013) and 89.4% of India's farmers hold less than two hectares of land and are focused on subsistence farming (MoSPI 2021). India's climate action policy, therefore, considers emissions from the agricultural sector as "survival emissions" (PIB 2023a), which are necessary for food security and socioeconomic development, given that the burden of emissions reduction cannot be put on small and marginal farmers (MoEFCC 2023). The focus has been on enhancing climate adaptation and resilience in the agricultural value chain, including downstream, upstream, and farming/agricultural activities, to manage the adverse impacts of climate change and ensure food security. From a governance and structural perspective, agriculture falls under the state subject list in the Indian constitution, meaning that the central government cannot fulfill major policy objectives without state cooperation.

2 India's financial year (FY) runs from 1 April to 31 March of the following year.
3 The 4th BUR was submitted on December 30, 2024, with the press release held in the first week of January 2025. While writing this report, BUR3 was referenced, and accordingly, the data presented is derived from it.

There are no official or market estimates of the finance required to achieve a sustainable transformation and the climate action in India's agriculture sector, though various stakeholders have provided estimates for different aspects. For climate adaptation, the Department of Economic Affairs (DEA) released a preliminary estimate in 2020 that India would need around USD 206 billion (at FY 2014-15 prices) between 2015 and 2030 for adaptation action in the agriculture, forestry, fisheries, infrastructure, water resources, and ecosystems sectors. To achieve India's Intended Nationally Determined Contribution under the Paris Agreement by 2030, although no commitment has been made on climate mitigation in agriculture, an estimated 16% of the total USD 834 billion mitigation investment budget—approximately USD 133 billion—will need to be allocated to the agricultural sector (Adhya et al. 2024). Other calculations concerning achieving the Sustainable Development Goals by 2030 estimate that India requires USD 2.64 trillion in investment (Standard Chartered 2020). This creates a lack of clarity on the total financial investment required for an overall sustainable agriculture transformation, which includes ensuring food security, enhancing climate resilience, and reducing emissions.

More importantly, the share of agricultural emissions from total emissions reduced from 14.4% to 13.4% between 2016 and 2019 (Ministry of Environment, Forest and Climate Change 2023) indicating a potential decoupling of agricultural emissions from overall growth that needs further financial impetus. Careful assessment of the possible sources and volumes of finance required for India's transition to sustainable agriculture is essential. In this context, Climate Policy Initiative (CPI) has conducted this first-of-its-kind study to measure and evaluate finance flows to sustainable agriculture in India. The report leverages CPI's decade of experience in tracking and analyzing sustainable finance, such as CPI's global and national climate finance tracking reports.

It also presents opportunities for financial stakeholders to take action to enhance financial flows toward sustainable agriculture in India.

1.2 SCOPE AND RELEVANCE

This study presents the first comprehensive estimates of the financial flows toward sustainable agriculture in India. Following CPI's two-year tracking cycle for the financial years (FYs) 2020-21 and 2021-22, with a comprehensive analysis of the financial ecosystem, the research team collected data for financial flows that can drive the transition to sustainable agriculture. This work has yielded estimates of the flows of funds from public and private as well as domestic and international sources, detailing the financial instruments used and identifying the end users who benefit from these funds. It integrates a value-chain approach to assess sustainable agriculture in the country while operating within the government's set policy framework.

This comprehensive assessment provides valuable insights for regulators and policymakers and can support informed decision-making to help shape future policies aimed at enhancing agricultural sustainability. Furthermore, tracked financial flows provide a guiding framework for private investors, both domestic and international, by outlining potential investment opportunities in the sector. Finally, this study can serve as a foundational resource for cross-sectoral collaborations, public-private partnerships, and intergovernmental discussions, opening pathways for collaborative efforts to mobilize finance and foster sustainable practices in India's agricultural landscape.

This report tracks the sustainable agriculture finance flows for the FYs 2020-21 and 2021-22. This work included a literature review to understand the evolution of India's agricultural policy and goals, underscoring a shift toward sustainability and climate resilience. The study also presents an overview of the financial ecosystem in sustainable agriculture, encompassing macro-level public and private financing, meso-level intermediaries and financial flows, and micro-level beneficiaries throughout the agricultural value chain. The subsequent data collection phase drew data from various primary and secondary sources to build and categorize a consolidated database for analyzing India's financial flows for sustainable agriculture. We outline key findings from this tracking work, along with opportunities for action that could align agricultural finance flows with food security and climate goals, support resource mobilization, and foster innovation and partnerships in the agriculture value chain.

2. SUSTAINABLE AGRICULTURE: POLICY LENS

This section outlines the evolution of India's sustainable agriculture journey using a policy lens and the components of the country's agriculture finance ecosystem: Sources, actors, and beneficiaries.

2.1 EVOLUTION OF INDIA'S AGRICULTURAL POLICIES

In India, agriculture is defined broadly as including traditional farming and various allied sectors such as horticulture, animal husbandry, forestry, dairy and poultry farming, and pisciculture (NABARD 2018). India's national agricultural policies have evolved from the 1950s to the 2000s through four distinct phases (Rao 1996; Arora 2013):

1. Pre-Green Revolution (1950/51 to mid-1960s)
2. Green Revolution (mid-1960s to 1980)
3. Post-Green Revolution (early 1980s to 1990)
4. Economic Reform Period (1991 to 2000)

Notwithstanding notable achievements during the above periods (outlined in Annexure 1), challenges remain for India's agriculture sector. These include the prevalence of smallholders, low productivity, climate change, pressure on natural resources such as water, and an underdeveloped food processing and retail sector (Dhoot 2005). To address these issues and to ensure food security, India has moved to its 5th phase of sustainable agriculture policy.

2.1.1 ONSET OF PHASE 5: SUSTAINABLE AGRICULTURE IN INDIA

India's shift to sustainable agriculture became apparent through the National Agricultural Policy (NAP), published in 2000, which aims to "attain output growth rate in excess of 4% per annum in the agriculture sector based on efficient use of resources" (PIB 2004). The NAP shifted the country's overall policy outlook toward promoting technically sound, economically viable, environmentally non-degrading, and socially acceptable use of natural resources: land, water, and genetic endowments.

In 2004, India's first National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) explicitly acknowledged the risks to the country's food security posed by climate change, which threatened to lead to increased frequency and intensity of droughts and floods, thereby putting the livelihoods of small and marginal farmers at risk.[4] The National Communication suggested that the focus should be on creating "no-regrets" adaptation strategies for sustainable agricultural development. Such strategies could include altering crop practices, watershed management, adopting resource-conserving technologies, and better land-use and risk-management policies. The National Communication also covered institutional

4 Farmers that cultivate less than two hectares of farmland are referred to as small and marginal farmers

support such as early warning systems and government initiatives like crop insurance and watershed projects, along with farmer participation in improved irrigation management and cited techniques like rainwater harvesting, zero tillage, and crop diversification as crucial for addressing climate change impacts and reducing water stress in agriculture (Ministry of Environment and Forests 2004).

The Government of India's 1st, 2nd, and 3rd BURs[5] to the UNFCCC highlight the sustainability push for agriculture through projects, including the National Innovations on Climate Resilient Agriculture (NICRA) launched in 2011, which focuses on natural resource management, soil health, and crop and livestock adaptation to climate change. These BURs also underscored India's promotion of systems of rice intensification and crop diversification to reduce methane emissions and water use. In addition, the National Agroforestry Policy, launched in 2014, promoted tree plantations to enhance productivity and sequester carbon. The BURs have also showcased programs, including the National Food Security Mission and Pradhan Mantri Krishi Sinchayee Yojana (Prime Minister's Agriculture Irrigation Scheme), which aimed to improve irrigation efficiency and boost food production (UNFCCC 2015, 2018, and 2021).

In 2015, India's Intended Nationally Determined Contribution communicated the central government's emphasis on sustainability and climate resilience in agriculture through key initiatives, including the National Mission for Sustainable Agriculture (NMSA), which focuses on enhancing food security, conserving resources like land, water, and biodiversity, and promoting climate-resilient crop varieties (GoI 2015). Furthermore, the Committee on Doubling Farmers' Income submitted its report in 2018 that focused on promoting sustainable agriculture through various initiatives, including climate-resilient agriculture, rainfed agriculture, conservation agriculture, ecology farming, watershed management systems, integrated farming systems, organic farming, agro-climatic regional planning, agricultural resources management, and micro-level planning.

2.1.2 OBJECTIVES FOR SUSTAINABLE AGRICULTURE IN INDIA

The above policies and official communications of the Government of India signal a strong shift toward sustainable agriculture that is focused on resource efficiency, food security, climate adaptation, and ecosystem resilience. Based on the analysis of these documents, this study breaks down the policy shift under three objectives of sustainable agriculture, described below, with more detail provided in Annexure 2.

1. **Ensuring food security:** India's focus on maintaining a stable and accessible food supply for its population has been on increasing crop productivity through crop diversification, multi-cropping, and watershed management. Allied activities like animal husbandry and aquaculture are also prioritized, along with the promotion of eco-friendly mechanization and resource-conserving technologies. Additionally, the focus has shifted from water-intensive crops to alternatives like pulses and oilseeds to address soil fertility and water conservation challenges.
2. **Reducing GHG emissions:** Minimizing the environmental footprint of agriculture, particularly in terms of GHG emissions, has resulted in policies focused on adaptation-led mitigation in agriculture. This has included an emphasis on resource-conserving practices like zero

5 1st, 2nd, and 3rd Biennial Update Reports (BURs) were published in 2015, 2018, and 2021 respectively.

tillage, which helps retain soil carbon, thereby reducing CO_2 emissions. Policies also focus on improving irrigation efficiency, optimizing fertilizer use, and promoting organic practices to lower GHG emissions, including CO_2, methane, and N_2O. There is also a push toward better livestock feed management and precision irrigation that reduces emissions while enhancing agricultural sustainability.

3. **Enhancing climate resilience:** India's efforts to enhance the agriculture sector's ability to withstand and adapt to climate challenges have been focused on reducing water stress and managing risks through improved irrigation, rainwater harvesting, and low-cost technologies like drip irrigation and zero tillage. The country's policies encourage altering crop agronomy, optimizing planting dates, and adopting crop diversification to better adapt to changing climates. Additionally, enhanced risk management through early warning systems and crop insurance is key to preparing for climate extremes and ensuring sustainable agricultural practices.

2.1.3 SUSTAINABLE AGRICULTURE IN INDIA: A VALUE-CHAIN PERSPECTIVE

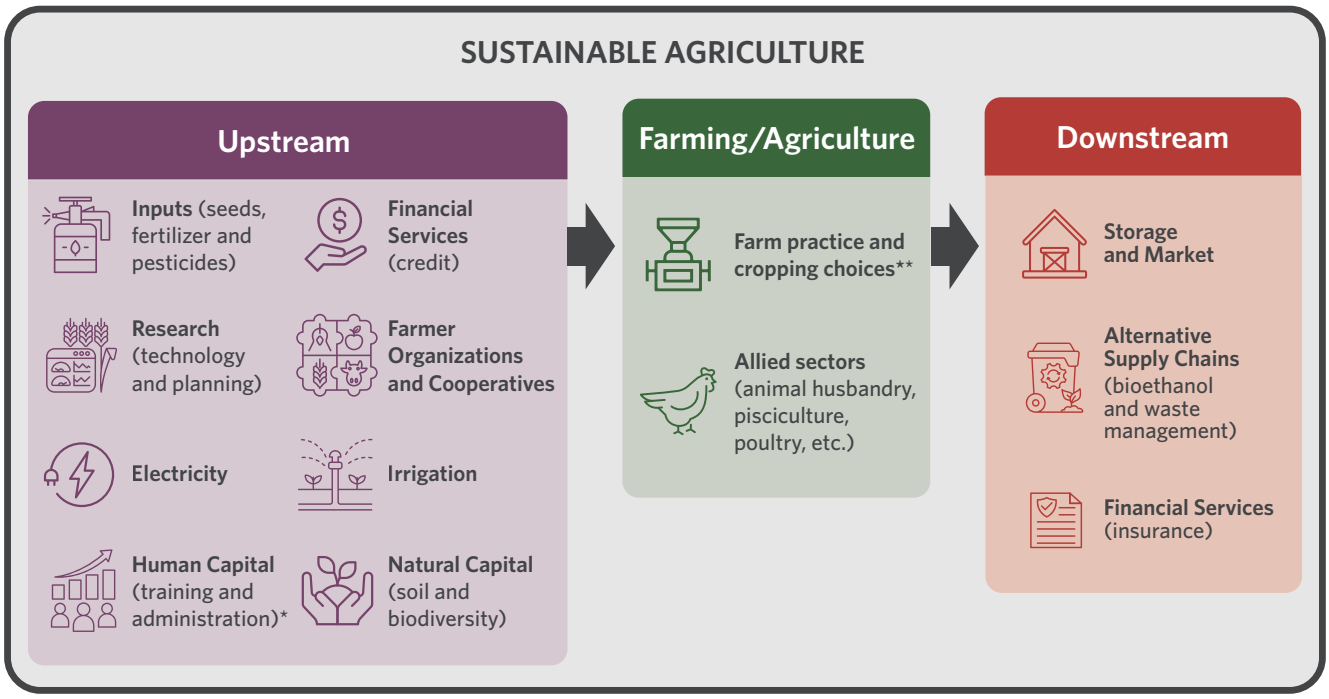
Sustainable agriculture is described using various terminologies in India. These include the well-known concept of climate-resilient agriculture or cow-based natural farming, as well as Jaivik Kheti, Sahaj Kheti, Sajeev Kheti, Yogic Kheti, Ahimsa Farming, Homa Farming, and Gou Aadharit Kheti,[6] to name a few (Khurana and Kumar 2020).

India's flagship NMSA, launched in 2014 under the National Action Plan on Climate Change, describes sustainable agriculture as a way of enhancing agricultural productivity, focusing on integrated farming, water use efficiency, soil health management, and synergizing resource conservation (DoAFW n.d.).

Currently, there is no single comprehensive framework that defines sustainable agriculture from a value-chain perspective in India. Therefore, this study has adopted a value-chain approach, which considers the entire agricultural system from upstream activities (such as input provision and resource management) to farming/agriculture activities, and downstream activities (such as post-harvest management and market linkages). To map India's sustainable agriculture policy landscape, this study reviewed existing literature and government's policies utilizing the three objectives for sustainable agriculture: (1) food security, (2) emissions reduction, and (3) climate resilience. Such a holistic view helps to identify the sectors relevant to these objectives (see Figure 1) for integrated sustainability across all stages of the agriculture value chain.

6 These terms do not have a direct translation but are variants of organic and natural farming that can be defined as sustainable agriculture in India.

Figure 1: Sustainable agriculture activities and sector classifications



* This includes component of extension services which is calculated separately.
** This includes expenditure on farming methods and cropping systems (e.g., organic farming, systems of rice intensification, promotion of millet and crop rotation) that support sustainable agriculture objectives-food security, emission reduction and climate resilience.

Upstream activities in the agriculture value chain encompass the essential inputs and resources necessary for sustainable farming practices. Key among these is the **electricity** sector, which supports vital operations like irrigation systems and mechanization, ensuring efficient and consistent production cycles. **Inputs** such as seeds, fertilizers, and pesticides boost productivity and crop health, while **irrigation** infrastructure plays a crucial role in water management, enhancing the efficiency of water use across farmlands. Access to modern **research and technology**, such as advanced irrigation systems, pest-resistant seeds, and climate-resilient crop varieties, drives yields and helps farmers adapt to changing environmental conditions. **Human capital**, which includes farmer training, extension services, and policy administration, equips farmers with the skills and knowledge to implement sustainable agricultural practices effectively. Furthermore, the role of **farmer organizations and cooperatives** is vital in strengthening collective efforts, improving access to markets, and fostering resource-sharing among smallholder farmers. Lastly, the sustainable management of **natural capital**, such as soil and biodiversity, ensures the preservation of ecosystem services that are fundamental to maintaining the long-term health of agricultural systems.

Agricultural activities encompass the processes that support core production, including both crop cultivation and related sectors such as livestock and fisheries. These **allied sectors** play a crucial role in diversifying farm incomes and enhancing resilience against environmental risks. **Cropping choices** are often shaped by government incentives and market demand, with both increasing emphasis on sustainable practices. This includes the adoption of drought-resistant crops or varieties with low input requirements, helping to optimize resource use and mitigate environmental pressures. **Farming practices** such as conservation agriculture and organic

farming are gaining prominence, driven by increasing demand for sustainable practices. These methods reduce the environmental impact of farming and improve long-term productivity and soil health, ensuring a more resilient agricultural system.

Downstream activities in agriculture encompass post-production processes that ensure the economic viability of farming. A key focus is on developing **alternative supply chains** that provide new avenues of farmer income through farm waste management and bioethanol production. Enhancing **storage and market** infrastructure, such as modern cold chains and warehouses, is critical for reducing post-harvest losses and ensuring timely produce delivery to markets. **Financial services (insurance)** also play a significant role in risk management, protecting farmers from unpredictable weather, pest outbreaks, or price fluctuations. Insurance products are vital in stabilizing farmer incomes and maintaining the resilience of the agricultural sector.

2.1.4 MAPPING OF SUSTAINABLE AGRICULTURE POLICIES IN INDIA

Our literature review found various national schemes and initiatives address aspects of agricultural sustainability, they remain fragmented and lack a unified structure. In response to this gap, this study has developed a comprehensive, criteria-based framework presented in **Table 1**, which is based on government policies and initiatives and designed to guide the identification of sustainable agriculture practices across the country.

Table 1: Sustainable agriculture sector policy mapping framework

Activity	Sector	Government of India policies/schemes/initiatives (since 2004)
Upstream activity	Electricity	• PM-Kisan Urja Suraksha evam Utthan Mahabhiyan Yojana[7] • National Agriculture Bank for Agriculture and Rural Development's solar pump project • Agriculture Demand Side Management (AgDSM) Program
	Inputs	• Nutrient-subsidy scheme for fertilizers • Paramparagat Krishi Vikas Yojana (PKVY)[8] • PM Prime Minister's Programme for Restoration, Awareness, Generation, Nourishment, and Amelioration of Mother Earth (PM-PRANAM) Yojana[9] - biofertilizers promotion • Neem Based Urea initiative • National Mission for Natural Farming • Integrated Pest Management • National Innovations in Climate Resilient Agriculture- Seeds • Sub-Mission On Seed and Planting Material
	Irrigation	• PM Krishi Sinchayee Yojana[10] • NMSA- National Mission on Sustainable Agriculture- Rainfed Area Development • Integrated Watershed Management Programme • Command Area Development and Water Management (CADWM) Programme
	Financial services (credit)	• Priority-sector lending requirement • Agriculture Interest Subvention Scheme
	Research: Technology & planning[11]	• ICAR: Agro-climatic zoning farms/models • ICAR'S NICRA (Climate Resilient Agriculture) • Indian National Agricultural Research System (NARS) • NMSA-National Mission on Sustainable Agriculture- Climate Change and Sustainable Agriculture: Monitoring, Modeling and Networking • Mission on Agricultural Mechanisation • National Mission on Strategic Knowledge for Climate Change • NDMA-Disaster Alert System
	Human capital	• Central Agriculture University & State Agriculture University • Krishi Vigyan Kendras Network[12] • ATMA Scheme
	Farmer organizations and cooperatives	• Promotion of farmer-producer organizations and cooperatives
	Natural capital	• NMSA-Soil health management • Soil Health Card Scheme

7 PM-Kisan Urja Suraksha evam Utthan Mahabhiyan Yojana translates to Farmer Energy Security and Progress Mega Program Scheme.
8 Paramparagat Krishi Vikas Yojana translates to Traditional Farmer Development Scheme.
9 PM PRANAM Yojana is a recent government scheme launched in 2023. The framework mentions the scheme to highlight the policy shift in the input sector, but for the time period tracked in the study the financial data will not be available.
10 PM Krishi Sinchayee Yojana translates to PM Farmer Irrigation Scheme.
11 The term Research: Technology and planning encompasses research of innovation and technologies (inputs, machines, or equipment), better methods, and practices in the agri-value chain. Moreover, this covers activities that involve setting up research centers, policy planning and capacity building around them.
12 Krishi Vigyan Kendras Network translates to Farmer Knowledge Centres Network.

Activity	Sector	Government of India policies/schemes/initiatives (since 2004)
Farming / Agriculture Activity	Allied sectors	• Pradhan Mantri Matsya Sampada Yojana • National Fishery Policy 2024 • National Horticulture Mission • Rashtriya Pashudhan Vikas Yojna[13]
	Farming Practices/ Cropping Choices	• NMSA-National Mission on Natural Farming-Direct seeding, zero tillage, soil mulching • PKVY-Organic farming • Rashtriya Krishi Vikas Yojana[14] • NMSA-Sub-mission on Agro-forestry • National Biogas and Manure Management Programme • NMSA-National Bamboo Mission • System of Rice Intensification • National Livestock Mission • ICAR-GSM & AGR Division • National Mission for Food Security-Crop based • National Mission on Edible Oils (NMEO) • National Oil Seed Mission • Production linked incentive Industry for Millet-based products • Initiative for Nutritional Security through Intensive Millet Promotion
Downstream Activity	Alternate Supply Chain	• National Biofuel Policy 2018-Bio CNG • PM JI-VAN Yojana with ethanol blending targets • SAMARTH Scheme • SATAT Initiative
	Storage	• Integrated Cold Chain Infrastructure • FCI & WCI storage infrastructure
	Financial Services (Insurance)	• PM Fasal Bima Yojana[15]

Source: *CPI Analysis, 2024*

This framework was developed to provide guardrails for identifying finance flows and was finalized based on a literature review, engagement with stakeholders from the Impact Investors Council, the National Agriculture Bank for Agriculture and Rural Development (NABARD), as well as closed-door stakeholder discussions at Shakti Sustainable Energy Foundation. This study follows India's policy emphasis on overall sustainability in agriculture, including food security and emissions reduction.

13 Rashtriya Pashudhan Vikas Yojna translates to National Animal Wealth Development Scheme.
14 Rashtriya Krishi Vikas Yojana translates to National Farmer Development Scheme.
15 PM Fasal Bima Yojana translates to PM Crop Insurance Scheme.

3. APPROACH AND METHODOLOGY

This report leverages CPI's methodology developed over a decade of tracking and analyzing climate finance through its global and national tracking reports. However, the scope of what is tracked has been broadened to encompass not just climate finance for agriculture, but also sustainable finance for agriculture to align with Government of India policies. Given the broader scope of this exercise and different methodological boundaries, our report captures a higher value of finance flows than studies that focus only on climate finance.[16]

The Government of India notes in its National Communication to the UNFCCC that agriculture cannot solely bear the burden of climate mitigation, given that India's focus for agriculture must also be on ensuring food security, providing livelihoods, and climate adaptation (MoEFCC 2023). Thus, its schemes and structures to enable agriculture-related finance flows are not designed solely with a climate lens, but with a broader focus on sustainable development. This report, therefore, tracks sustainable finance flows as opposed to climate flows to agriculture in India.

To track the sustainable finance flows, we used the UNEP definition that demarcates climate, green, and sustainable finance (UNEP 2016). However, to facilitate the collection, preparation, and analysis of data, we adopted a policy-mapped understanding of India's sustainable agriculture and an accounting methodology to ensure comparability across datasets and avoid overlaps to the extent possible.

This study is based on empirical data from a wide range of primary and secondary sources. We categorized financial flows for sustainable agriculture by distinguishing between public and private, domestic and international sources and intermediaries. In addition, we identified various financial instruments and the end recipients of agricultural activities and sectors in the value chain.

This section outlines the financial data sources used, the approach for determining finance flows, assumptions, and data limitations and considerations in the Indian agriculture finance ecosystem.

3.1 SUSTAINABLE AGRICULTURE FINANCE FLOWS: APPROACH AND DATA SOURCES

For each of the sectors mentioned, we collected data on actual disbursements rather than commitments for FYs 2020-21 and 2021-22.

Disbursement refers to the flow of capital from sources and intermediaries to recipients, whereas the **end use** of these funds is defined as the type of sustainable agriculture activities being financed. This includes downstream, agriculture/farming activity, and upstream activity across the agriculture value chain. We have further disaggregated each sectoral investment into several subsectors.

Distinguishing between the sources of capital and intermediaries can be challenging, particularly when there are multiple levels of disbursement. In this study, we categorize all funds originating from the Indian exchequer (union and state governments) as **public sources, also including**

16 For example, the Landscape of Green Finance 2024 reports biennial average of INR 265 billion (USD 3.5 billion) for on farm adaptation related activities in agriculture.

flows from public sector undertakings (PSUs). Flows from development finance institutions (DFIs) are classified as public and further categorized as multilateral, bilateral, and national.

For **private finance sources**, we consider corporate actors (including private equity/venture capital [PE/VC] and balance sheet financing), project developers (involving project debt and equity, as well as balance sheet financing), households, and financial institutions (FIs) as the primary sources of funds.

We label the **financing type as domestic** if the funds flow from the Government of India's account (national and subnational tiers) or if they are raised by public and/or private entities (including residential, commercial, and institutional) in the jurisdiction of India. Any funds raised outside India by issuing bonds, through external commercial borrowings, foreign equity, or any other financial instrument like concessional debt and grants are treated as **international financing.**

Data on sustainable finance flows toward agriculture is collected from various sources (**Table 2**). The data collection will involve primary and secondary research collecting disaggregated data on disbursements.

Table 2: Sources of data

Domestic	Public	Government budgets	a. Central and state budgetary allocations. This includes the annual statements and demand for grants issued by different departments and ministries. b. Government schemes and initiatives of central and state government administered by different departments and ministries c. Dedicated Agriculture Funds and related datasets (NABARD, RBI) d. Annual financial statements of central agricultural PSUs
		Notifications / reports	a. Annual Reports and financial statements of state-owned institutions like NABARD, Indian Council of Agricultural Research, Indian Metrological Department, National Cooperative Development Council, Central Water Commission, National Center for Seismology and Indian National Centre for Ocean Information Services, Wildlife Crime Control Bureau, Departments of Forest and Wildlife, National Biodiversity Authority, and Protection of Plant Varieties and Farmers Rights Authority b. India's BUR and National Communications to the UNFCCC c. PIB press releases
International	Private	Foreign direct investment	a. Foreign direct investment (FDI) data from the Department for Promotion of Industry and Internal Trade, Ministry of Commerce, and Industry b. RBI data on the inflow of international funds c. PIB press releases and government's responses to Parliament questions
		Private/ Projects	a. RBI database on credit disbursed by banks and other FIs. b. NABARD's State-Focused Papers and Potential Linked Plans. c. Data for impact investments and PE/VC using Tracxn tool
		DFI investments	a. Financial mechanisms within the UNFCCC framework such as GCF, GEF, etc. b. Data on ODA and other official flows from bilateral and multilateral DFIs sourced from the OECD database c. Funds provided by the Asian Development Bank, World Bank, etc.
		Philanthropic grants	a. Data on philanthropic grants for sustainable agriculture sourced from the OECD database

Finally, the tracked financial flows are categorized based on the type of financing instrument used—such as grants, debt, equity, balance sheet financing, and guarantees.

3.2 ASSUMPTIONS

This section outlines the overall assumptions and methodological clarifications applied in this study:

- This study primarily focuses on the agricultural element of AFOLU (agriculture, forestry, and other land use). Agroforestry is also included, but other components of forestry and land use are not.
- The agriculture value-chain perspective of the study was restricted to agriculture and allied activities/sectors, encompassing their backward and forward linkages. The list of sustainable agriculture activities and sectors included and tracked was affirmed and ring-fenced based on India's existing policy literature and expert opinions, as referenced in Table 2.
- A list of excluded activities/sectors was identified as food processing, pasture, sanitation and hygiene, marine fisheries, democratic participation and climate activism, policy management and planning, disaster relief, livelihood support programs, and land reforms and property rights.
- For state- and union-level public finance, tracking was based on identified departments, major and minor codes, and activities mentioned in the budget that aligned with the drafted sustainable agriculture framework. However, there will be some variation based on the classification approaches used by states.
- In public finance, the end use of financial flows from central/state government budgets is taken as the recipient mentioned in the budget document.
- The currency conversion rate used for FY 2020-21 is USD 1=INR 74.23, and for FY 2021-22, it is USD 1=INR 74.5.[17]

3.3 DATA CONSIDERATIONS AND LIMITATIONS

This section explores the challenges faced relating to public, private, and philanthropic finance data, and the steps taken to avoid double counting.

PUBLIC FINANCE DATA

i. This study tracks government expenditure on direction and administration, which includes salaries, office expenses, maintenance, and administrative costs.

17 The Reserve Bank of India is India's central bank and regulatory body and is responsible for the issue and supply of the Indian rupee and the regulation of the Indian banking system. TABLE 139 : Exchange rate of Indian rupee vis-a-vis the SDR, US Dollar, Pound Sterling, Euro and Japanese Yen. (Financial Year – Annual Average and End-year Rates). Reserve Bank of India (https://rbidocs.rbi.org.in/rdocs/Publications/DOCs/139T_13092024245FFE1BB8CB45C3A51183FB6ADA6DC8.XLSX)

ii. Due to the lack of detailed budget data for the state of Arunachal Pradesh, data collection was based on major codes rather than specific activities, while in Manipur, actual budget figures are only available for FY 2021-22.

iii. The study tracked "Interest Charges" mentioned in state budget documents.

iv. The study excluded "deduction" and "suspense" expenditures mentioned in state budget documents, given a lack of clarity on these expenditures' end use and utilization period.

v. The electricity subsidy or expenditure by union/state governments on rural electrification and the agriculture sector under major code 2801 is not included in the data, except for expenditure pertaining to new and renewable energy programs/activities.

vi. The study only tracks data from union government agriculture PSUs and not from states' agricultural PSUs.

vii. The annual financial statement for FY 2020-21 of union government PSU Hindustan Urvarak & Rasayan Limited was not available.

viii. For the financial flows of agricultural PSUs, the study counted net plant and equipment expenditure, total capital works in progress, and the purchase of stock. Other expenditures, including employee, administration, and finance costs were also counted.

ix. In public finance, NABARD-supported activities were included in the state budget data as these are not part of the debt financing projection under NABARD's State-Focused Papers.

PRIVATE FINANCE DATA

i. For private debt financing data, a quantitative approach was used to attribute a percentage of total projected agricultural debt finance for a certain credit category to the actual disbursements for that financial year.

ii. Private debt financing data was primarily covered through priority-sector lending under agriculture credit.

iii. Non-RBI-regulated entities were not covered due to fragmented data availability and lack of detailed end-use information.

iv. For FDI, the study assumed that finance was used in the same year it was received.

v. For PE/VC finance, the study accounted for all series and round finance flows under equity instruments.

vi. Project-level private finance data under the agriculture sector category was fragmented across various databases and was therefore not included in our tracking.

PHILANTHROPIC FINANCE DATA

i. For ODA, Other Official Flows (OOF), and philanthropic finance, this study accounts for sustainable agriculture activities in full, based on the assumption that they support broader agricultural value-chain activities.

ii. For corporate social responsibility data, there is a lack of granularity of end use in the available data. Therefore, these have been excluded from the study.

iii. For domestic philanthropy, there is no common database tracking disbursement and end use of the financial flows to the agriculture sector. Therefore, these have been excluded from the study.

AVOIDING DOUBLE COUNTING OF FINANCIAL FLOWS

i. This study excludes the central share of centrally sponsored schemes and central sector schemes from state budgets to avoid double counting.

ii. The research team has cross-checked externally aided projects mentioned in state budgets with the OECD database with OOF and ODA flows.

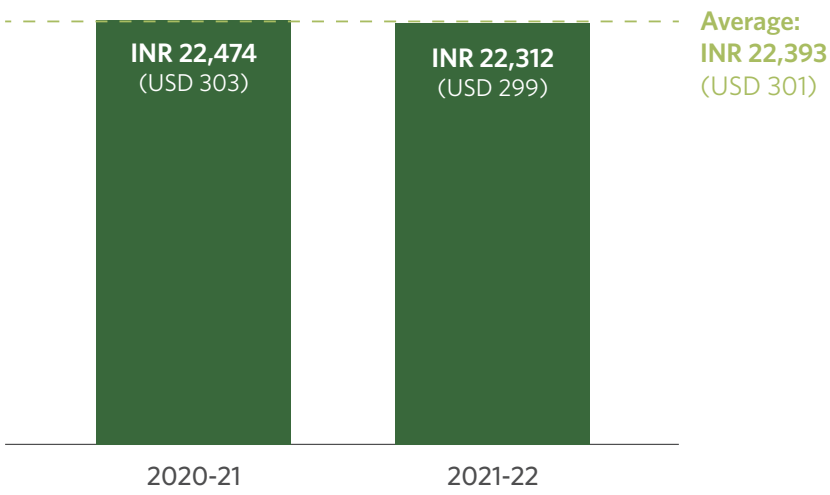
iii. The sum of subsidies mentioned in the annual financial statements of the agricultural PSUs has been netted from the union budget entries that provide subsidies to PSUs for the corresponding activity and sector.

4. KEY FINDINGS

4.1 OVERVIEW

Tracked financial flows to sustainable agriculture had an annual average of INR 22,393 billion (USD 301 billion) for the tracked period of FY 2020-21 and FY 2021-22. There was a marginal decline in flows, from INR 22,474 billion (USD 303 billion) in FY 2020-21 to INR 22,312 billion (USD 299 billion) in FY 2021-22.

Figure 2: Year-on-year changes in sustainable agriculture finance

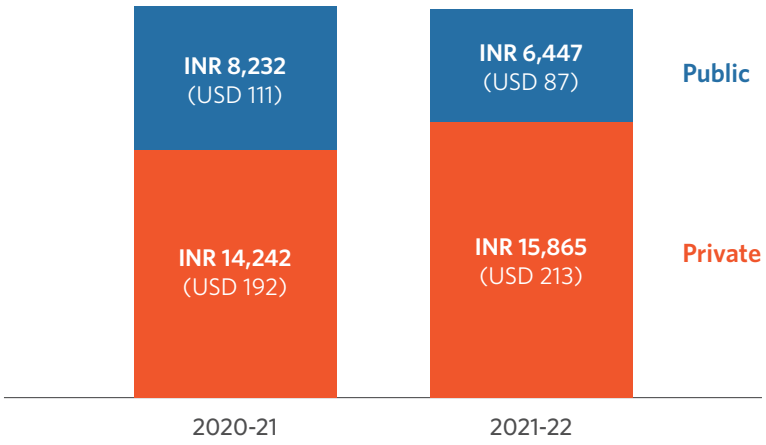


Public finance accounted for an annual average of INR 7,339 billion (USD 99 billion) across the two financial years. Public flows declined by 21.6% from INR 8,232 billion (USD 111 billion) in FY 2020-21 to INR 6,447 billion (USD 87 billion) in FY 2021-22. This was mainly because disbursements made under the Pradhan Mantri Garib Kalyan Ann Yojana (the Prime Minister's Food Security Scheme for the Poor) as part of India's COVID-19 response ended in FY 2021-22 (DEA 2022).[35]

Private finance accounted for an average of INR 15,054 billion (USD 202 billion) for both financial years, with an 11.4% increase from INR 14,242 billion (USD 192 billion) in FY 2020-21 to INR 15,865 billion (USD 213 billion) in FY 2021-22.

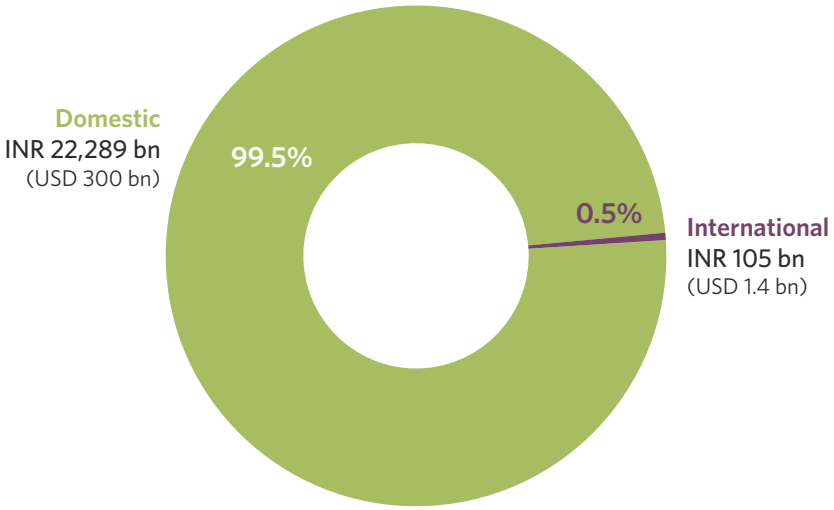
Figure 3: Sustainable agriculture finance by public and private sources

*All values are in **billions**.*



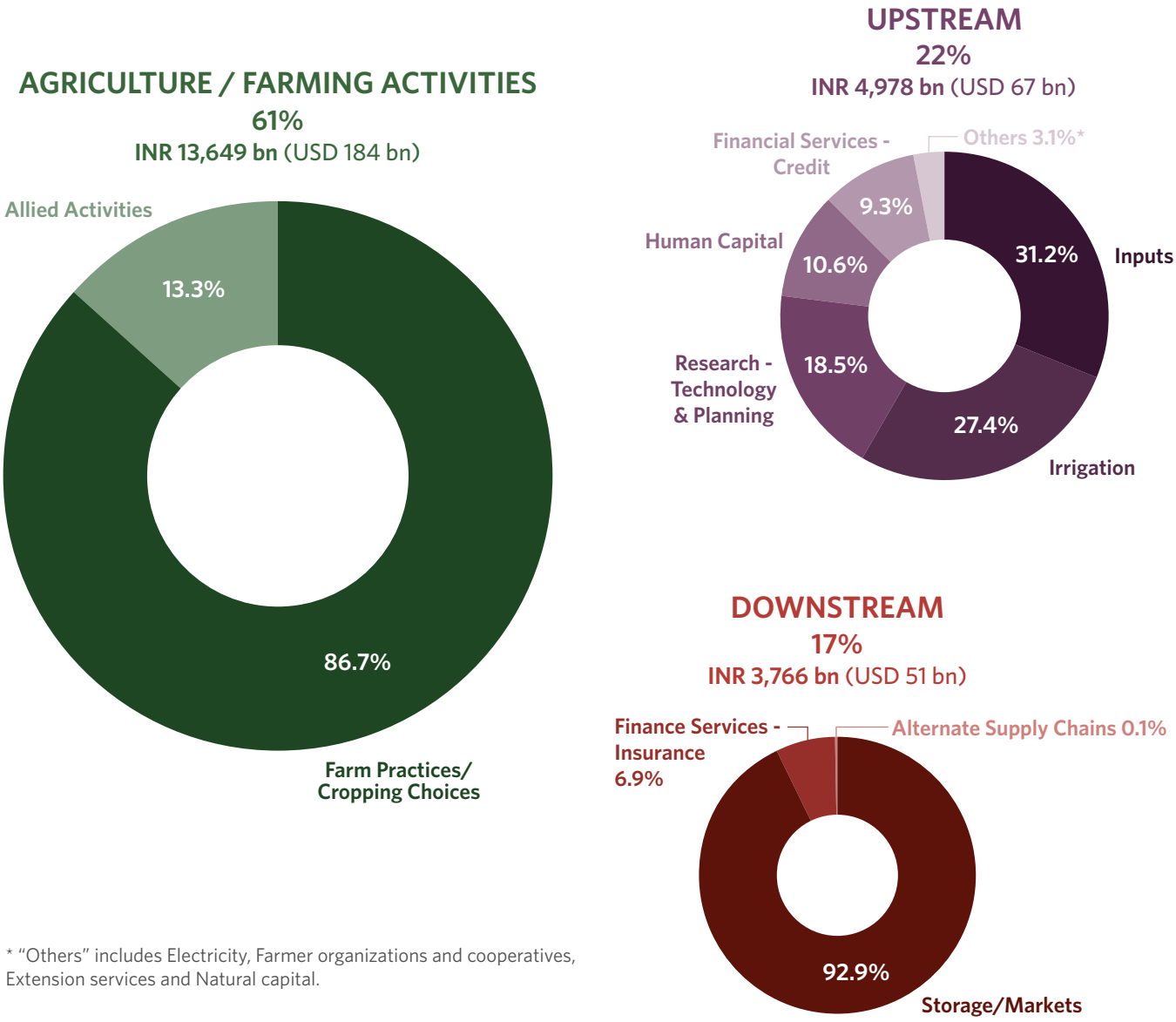
Domestic sources accounted for 99.5% of sustainable agriculture finance, averaging INR 22,289 billion (USD 300 billion) over the two tracked financial years. **International sources constituted just 0.5%,** averaging just INR 105 billion (USD 1.4 billion) for each financial year.

Figure 4: Sustainable agriculture finance by domestic and international sources



In terms of sustainable agriculture end use, the **largest share of tracked flows went to agriculture/farming activities (61%), with upstream activities constituting 22% and downstream activities 17%**.

Figure 5: Sustainable agriculture finance by sectors and activities



* "Others" includes Electricity, Farmer organizations and cooperatives, Extension services and Natural capital.

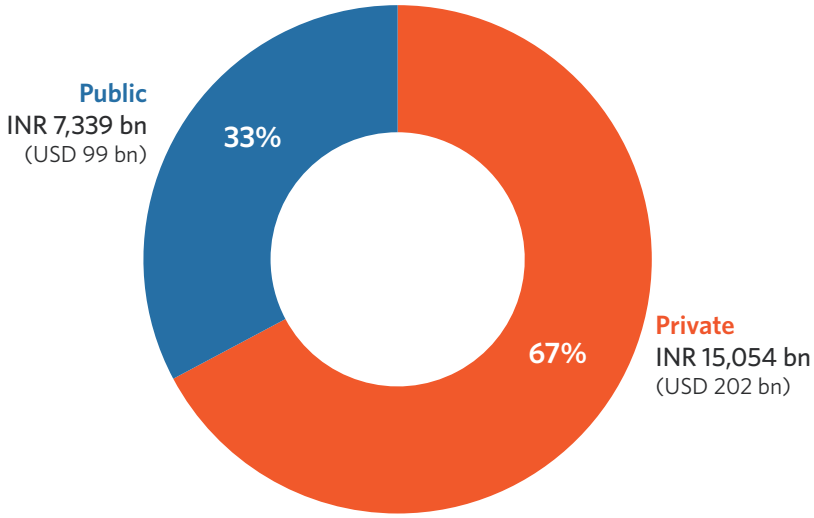
Note: Sum of components may not equal 100% due to rounding.

Sustainable finance for agriculture/farming averaged INR 13,649 billion (USD 184 billion) across the two tracked financial years, with farm practices/cropping choices receiving 86.7%, followed by 13.3% for the allied activity sector. Upstream activities averaged INR 4,978 billion (USD 67 billion), with the largest sectors within this activity being inputs (31.2%), followed by irrigation (27.4%). Finance for downstream activities averaged INR 3,766 billion (USD 51 billion), with 92.9% of these flows going to the storage/market sector.

4.2 SOURCES OF FINANCE

Public actors provided INR 7,339 billion (USD 99 billion) for India's sustainable agriculture finance on average between FY 2020-21 and FY 2021-22, while the private sector averaged INR 15,054 billion (USD 202 billion).

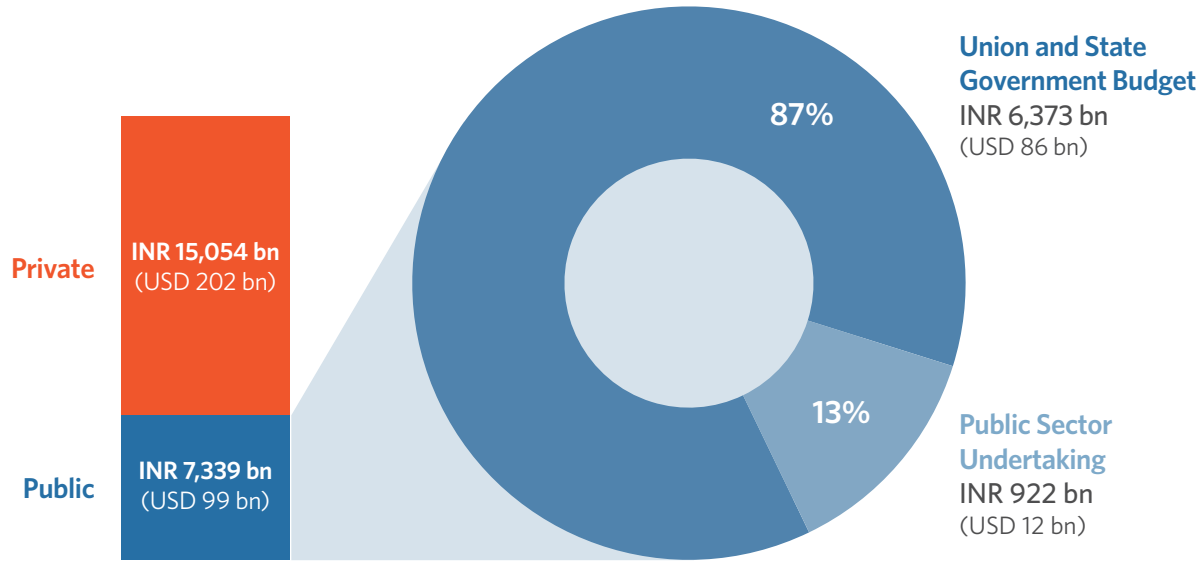
Figure 6: Sustainable agriculture by public and private sources



PUBLIC FINANCE

The public sector contributed about one-third of sustainable agriculture finance, averaging INR 7,339 billion (USD 99 billion) per year across FY 2020-21 and FY 2021-22. This was overwhelmingly from domestic sources—government budgets and PSUs—contributing 99.6% of public flows.

Figure 7: Public finance for sustainable agriculture by actors

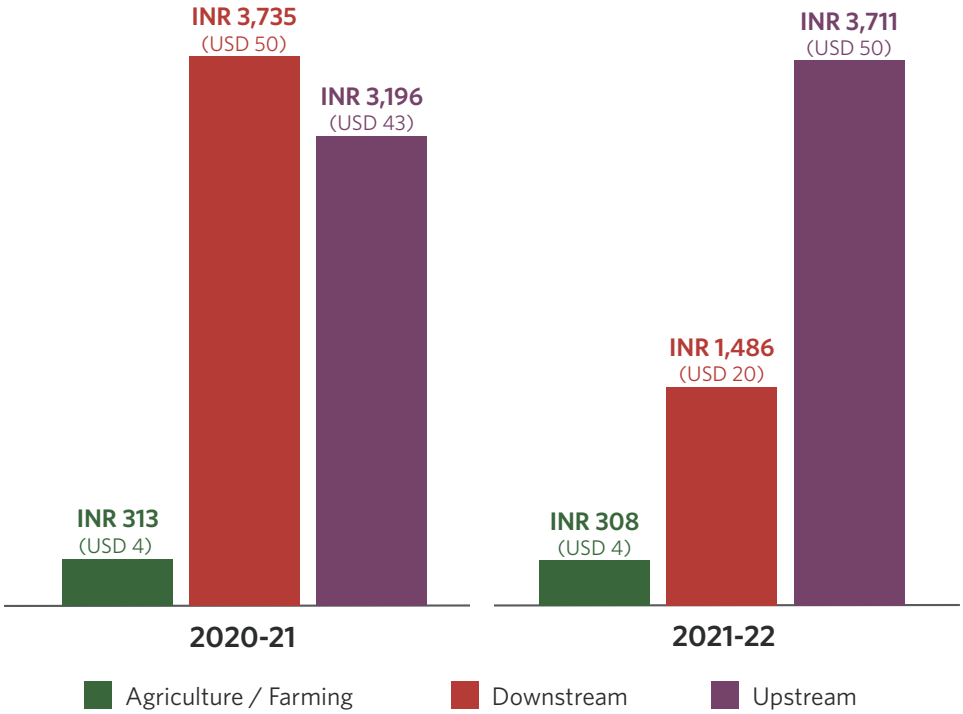


<1%: Multilateral DFI (INR 28 bn, USD 0.4 bn), Bilateral DFI (INR 15 bn, USD 0.2 bn)

Union and state governments' budgetary expenditure, averaging INR 6,373 billion (USD 86 billion) per year, was the leading source of public finance. Downstream activities—specifically the storage and market sector—received the highest share of government budgetary expenditure (48%) in FY 2020-21. This was due to disbursements under Pradhan Mantri Garib Kalyan Ann Yojana introduced as part of the economic response to COVID-19, as well as a pre-payment of around INR 1,500 billion (USD 20 billion) of outstanding food subsidy-related loans[18] of the Food Corporation of India (DEA 2022).

Figure 8: Government budgetary expenditure[19] for sustainable agriculture by activity

*All values are in **billions**.*



Over the broader period of FYs 2020-21 and 2021-22, upstream activities received the most government budgetary expenditure for sustainable agriculture, averaging 54% per year. The inputs, irrigation, and human capital sectors were the primary recipients within upstream activities.

Those Indian PSUs tracked for their sustainable agriculture finance provided an average of INR 922 billion (USD 12 billion) across FYs 2020-21 and FY2021-22. Their sectoral contribution was split between the storage and market sectors (73%) and the inputs sector (27%).

DFIs collectively contributed INR 43 billion (USD 0.6 billion) on average in the two years, constituting 0.6% of the total public finance. Multilateral DFIs contributed 65% of these

18 The Food Corporation of India (FCI) uses government funds and also borrows money to procure foodgrain from farmers at government-notified prices, which it then sells at lower subsidized prices. To boost liquidity and foodgrain procurement during the COVID-19 emergency, the FCI used the funds allocated by the government to prepay its existing obligations and reduce its reliance on borrowing while also freeing up bank loan books.
19 Government budgetary expenditure combines spending by both state and union governments.

flows, and bilateral DFIs 35%. The farm practice and cropping choices sector received the largest contribution from bilateral DFIs, averaging INR 7.3 billion (USD 98 million). Multilateral DFIs contributed the bulk of their flows to the irrigation sector—averaging INR 18.13 billion (USD 243 million)—followed by farm practice and cropping choices, averaging INR 3.46 billion (USD 46 million).

Box 1: Union government scheme to support agricultural income and employment

In addition to the items that fall under the sustainable agriculture policy mapping framework shown in Table 2, the Government of India has had other key policy priorities to ensure long-term agricultural development, enhance farmers' livelihoods, and boost the rural economy. Stated objectives include doubling farmer income by 2022 through productivity and market access improvements (PIB 2019), transforming India into a major agricultural exporter with exports growing from present ~USD 30+ billion to ~USD 60+ billion by 2022,(Ministry of Rural Development 2018) and reducing the vulnerability of farmers by promoting non-farm employment, and empowering women farmers (PIB 2024a).

The Government of India has implemented several schemes to support these objectives:

- **Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)** provides income support in the form of INR 6,000 (~USD 85)[20] annually to over 110 million farmers (PIB 2019).
- **Pradhan Mantri Kisan Maan Dhan Yojana (PM-KMY)** offers social security of INR 3,000 (~USD 42)[6] in monthly pensions to small and marginal farmers after age 60, with over 2.3 million enrolled (PIB 2024b).
- **Mahatma Gandhi National Rural Employment Guarantee Scheme,** linked to the agriculture sector, provides rural employment, creates durable assets, and enhances agricultural productivity, benefiting marginalized communities (PIB 2022).
- **The Price Support Scheme** ensures the procurement of pulses, oilseed, and copra, while the **Market Intervention Scheme** covers perishable agricultural and horticultural commodities, protecting farmers from distress sales (PIB 2019).
- **The Deendayal Antyodaya Yojana—National Rural Livelihoods Mission** recognizes the role of women in agriculture and focuses on training, capacity building, and promotion of agroecological practices to increase incomes (Ministry of Rural Development 2019).

These national government schemes supporting Indian agriculture have significantly boosted financial security, protecting livelihoods and vulnerable farmers. With small and marginal farmers constituting 89% of agricultural households (MoSPI 2021), these schemes can contribute to economic, environmental, and food security, which are vital for climate adaptation, rural development, and India's sustainable agricultural growth (Ministry of Environment and Forest 2004).

20 Given that the scheme was launched in 2019, the exchange rate used is INR 70.90/USD 1.

Box 2: Subnational action on sustainable agriculture: State scheme and reporting best-practice

Green and sustainable agriculture reporting

Green budgeting is an innovative fiscal policy approach that integrates environmental considerations into the budgeting process. Mainstreaming climate action across sectors, especially agriculture, is crucial. Agriculture significantly impacts the climate, contributing to GHG emissions, deforestation, and water use. Making agriculture more sustainable is a major contribution to broader climate action, and green budgeting is a step in this direction.

Bihar was the first state in India to implement green budgeting, releasing its inaugural Green Budget in FY 2020-21. This aimed to reorient resource allocation by integrating environmental priorities into development programs to foster a greener and more sustainable future. Assam was the second state to launch a Green Budget in FY 2023-24. Meghalaya and Odisha have also introduced climate budgets, while Kerala has an environmental budget. Although primarily designed to track climate action, these budgets also provide valuable insights into public finance for sustainable agriculture in these states.

Bihar's Green Budget for FY 2024-25 includes a comprehensive array of initiatives across several key departments. The budget incorporates 65 schemes from the Department of Agriculture, 13 from the Department of Animal and Fisheries Resources, 22 from the Department of Water Resources, and 12 from the Department of Minor Water Resources. Together, these schemes cover a significant portion of the agricultural value chain, reflecting a holistic approach to sustainability and climate-resilient agricultural practices.

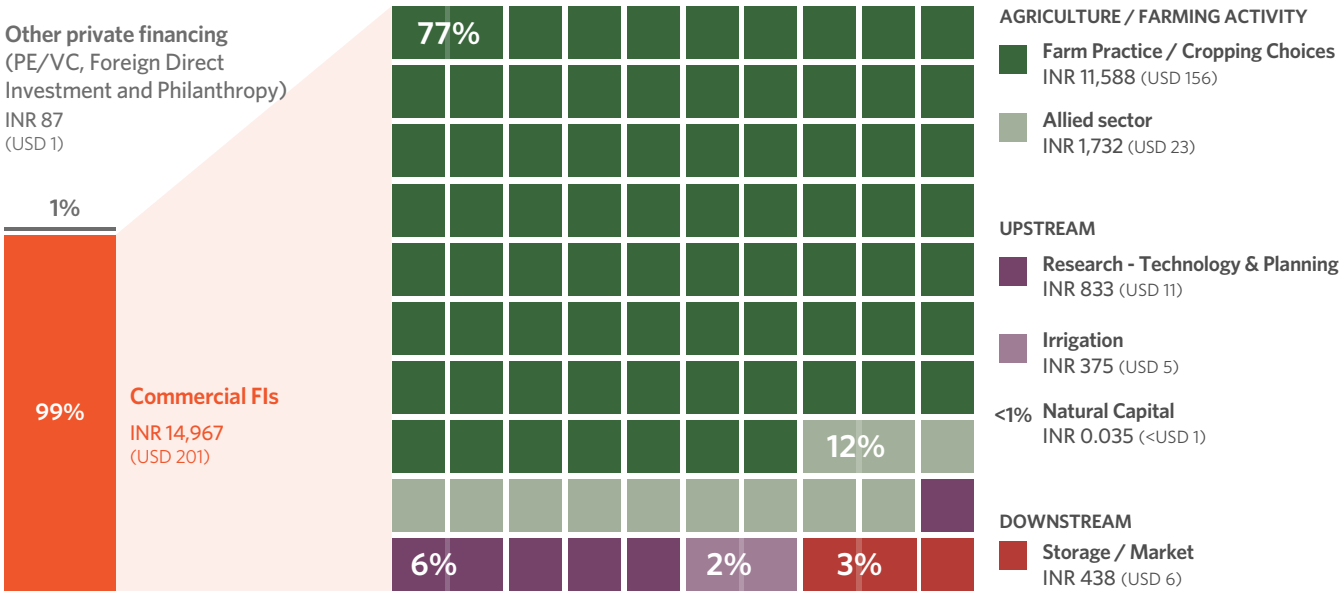
In contrast, Assam's Green Budget for the same period has a narrower focus, only including schemes from the Department of Agriculture and the Department of Irrigation. The budget does not account for schemes from the Department of Animal Husbandry and Fisheries, despite the crucial role these sectors play in enhancing the sustainability of agriculture and addressing climate change challenges.

PRIVATE FINANCE

Private finance contributed to about two-thirds of sustainable agriculture financing, averaging INR 15,054 billion (USD 202 billion) in FY 2020-21 and FY 2021-22 (see Figure 9).

Figure 9: Private finance for sustainable agriculture by funder types

*All values are in **billions**.*



Commercial FIs led private finance for sustainable agriculture, providing an average of INR 14,967 billion (USD 201 billion) each year and constituting 99.4% of private flows. Agriculture falls under the priority-sector lending guidelines of the Reserve Bank of India (RBI), India's central bank, which requires commercial FIs to hold 18% of their adjusted net bank credit or credit equivalent of off-balance sheet exposures in credit for agriculture and allied activities. Hence, agriculture/farming constituted 89% of total tracked flows from commercial FIs, followed by upstream activity (8%) and downstream activities (3%). While 77% of commercial FIs' flows went to the farm practice and cropping choices sector, it is encouraging that 6% went to research-technology & planning, growing by 8.2% year-on-year in the period analyzed.

Private equity/venture capital (PE/VC) funds' contribution to sustainable agriculture finance picked up pace, rising from INR 37.4 billion (USD 503 million) in FY 2020-21 to INR 95.4 billion (USD 1,280 million) in FY 2021-22. Downstream activities, particularly in the storage and market sector, averaged INR 39.24 billion (USD 527 million), followed by research averaging INR 11.4 billion (USD 152 million), seeing the highest flows from PE/VC funds during the period analyzed.

FDI flows also depict a similar significant increase from FY 2020-21 to FY 2021-22. FDI grew from INR 14.55 billion (USD 196 million) to INR 18.02 billion (USD 242 million) on account of increasing flows in the research and storage/market sectors. The inputs sector received the largest share of FDI flows (57%), though FDI to this sector declined from INR 13.8 billion (USD

184 million) in FY2020-21 to INR 5 billion (USD 67 million) in FY2021-22. FDI flows in agriculture remained negligible year-on-year with no contribution toward allied sectors.

Sustainable agriculture finance from philanthropic organizations averaged INR 4.1 billion (USD 56 million) in the period examined, with a slightly lower figure FY 2021-22 of INR 3.1 billion (USD 43 million). However, philanthropic flows diversified in terms of sectors targeted in FY 2021-22, expanding to fund research, inputs, and extension.

Box 3. Non-institutional credit in agriculture households is declining but still significant.

While Indian agricultural households favor formal credit markets, with lower interest rates, accessing them is often challenging. Lengthy processing times, the need to travel to banks, extensive paperwork, literacy requirements, and stringent loan conditions—e.g., for equity, collateral, and credit histories—along with customers' preference for cash payments over account transfers significantly increase the implicit cost of borrowing for agricultural households. Consequently, even subsidized credit programs can have high effective borrowing rates, leading many farmers to informal loan markets.

The size of flows through non-RBI-regulated credit sources is difficult to quantify. Monitoring, reporting, and verifying these flows present challenges due to the informal nature of some operations and the varying disclosure requirements of each lender. NABARD's National Financial Inclusion Survey 1.0 found that 72% of the total loans taken in FY 2015-16 by agricultural households in the sample were sourced from institutional sources and 28% from non-institutional ones. Among non-institutional sources, relatives and friends represented approximately 14% of the debt disbursed, followed by moneylenders at 9% (NABARD 2018a).

Bridging the gap with agriculture fintech

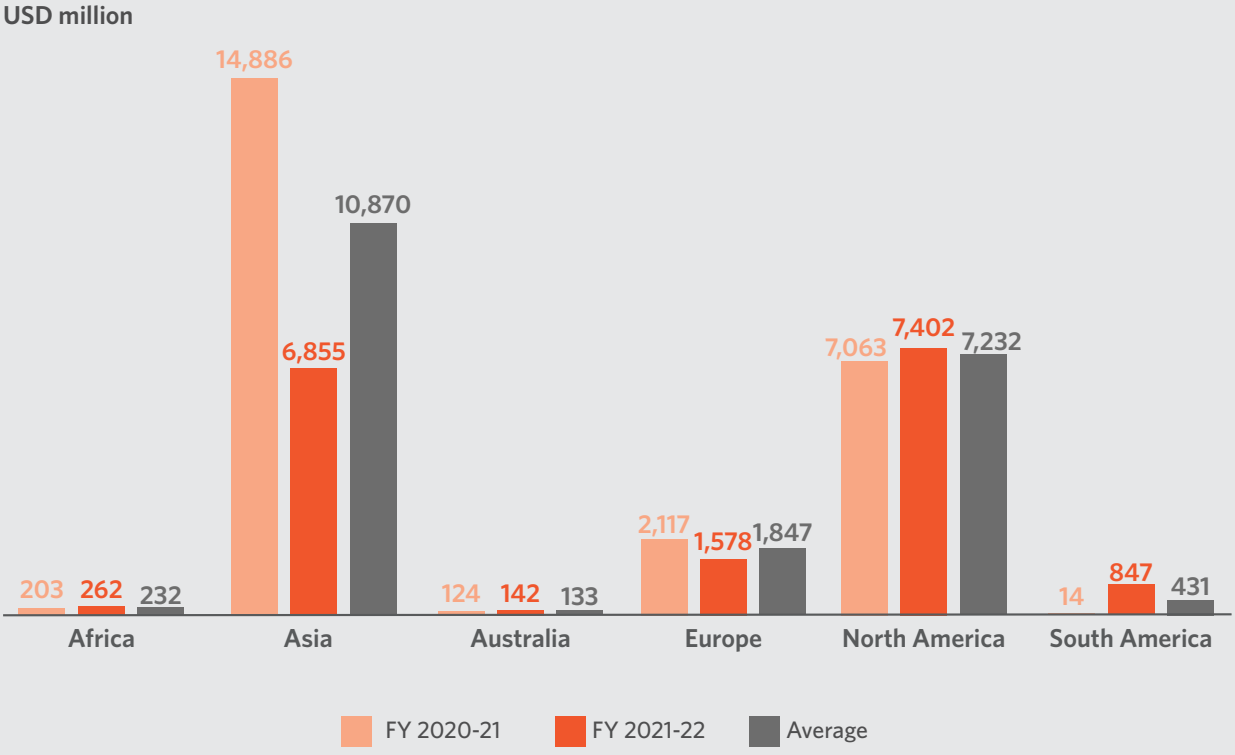
Non-banking financial companies (NBFCs) in India have leveraged fintech to provide an additional source of credit for the agriculture value chain. NBFCs have used their robust IT infrastructure to identify gaps and develop products for the agriculture credit market. One arm of NBFCs is taking up the credit market for agricultural machinery, input supply chains, aggregation, marketing, warehousing, and procurement operations. In addition, microfinance institutions funded by NBFCs through on-lending are taking up on-the-ground credit dispersal with robust collection efficiency. With flexible, tailored approaches and innovative risk assessments at the grassroots level, such entities are well-placed to bridge the gap currently filled by informal credit markets.

Box 4: Global comparison of PE/VC financial flows to agriculture

Tracked global PE and VC investment financial flows to the agrifoods sector have shown a positive outlook, especially in AgTech and agrifood technologies focused on improving productivity, climate resilience, and sustainability (CFA Institute 2021). According to the Tracxn Database, in FY 2021-22, global PE/VC funding to these sectors (both sustainable and agnostic of sustainability purposes) totaled USD 17 billion across 988 funding rounds. FY 2020-21 saw even higher investment, with USD 24 billion in funding spread over 912 rounds. PE/VC flows are showing a growing emphasis on sustainability-focused solutions in agriculture, driven by innovations in technology and data.

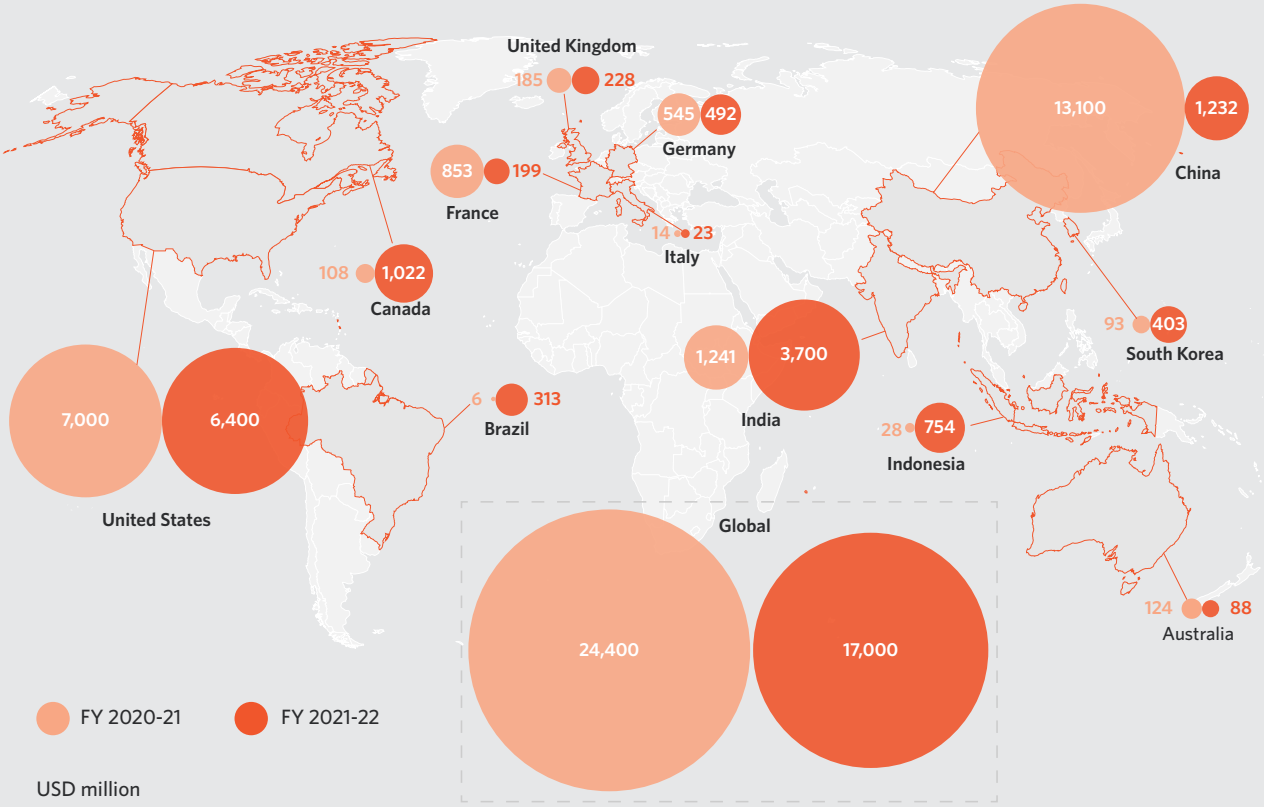
PE/VC flows to the agrifood sector show significant disparities by geographic region. For FY 2021-22, North America maintained its lead in PE/VC finance for agrifoods, followed by Asia and Europe, both of which saw declines. In FY 2020-21, Asia led the ranks, followed by North America and Europe, with South America, Africa, and Australia receiving much smaller shares of global flows.

Figure 10: PE/VC financial flows to the agriculture sector by continents



India's share in global PE/VC flows for agriculture has seen a notable increase, especially when compared to other G20 countries. India's funding in FY 2021-22 was substantially higher than Australia (USD 0.088 billion), France (USD 0.199 billion), and Germany (USD 0.491 billion), though the United States (USD 6.4 billion) and China (USD 1.23 billion) continue to attract the highest levels of investment globally.

Figure 11: PE/VC financial flows to the agriculture sector by major economies



In the context of global PE/VC flows, India accounted for approximately 21.76% of the global USD 17 billion total in FY 2021-22, a substantial contribution to the global agrifoods finance ecosystem. This positions India as a leading destination for PE/VC flows in agriculture, showcasing its importance in the global and G20 context.

Note: The agriculture sectors tracked in the global analysis presented in Box 4 differ from the scope of tracking in the rest of this report. While the main report focuses on India's sustainable agriculture activities and sectors, the global analysis in this box is focused on modern agriculture.[21] This broader tracking includes a wide range of agrifood sectors, which include, but are not limited to: agri fintech, aquaculture, agritech (e.g., smart farming, robotics, IoT, and AI), livestock tech, indoor farming (e.g., aquaponics and hydroponics, smart irrigation), crop management using drones, B2B Agri tech, plant breeding, farm-related e-commerce, and analytics software; and autonomous, precision, and sustainable farming.

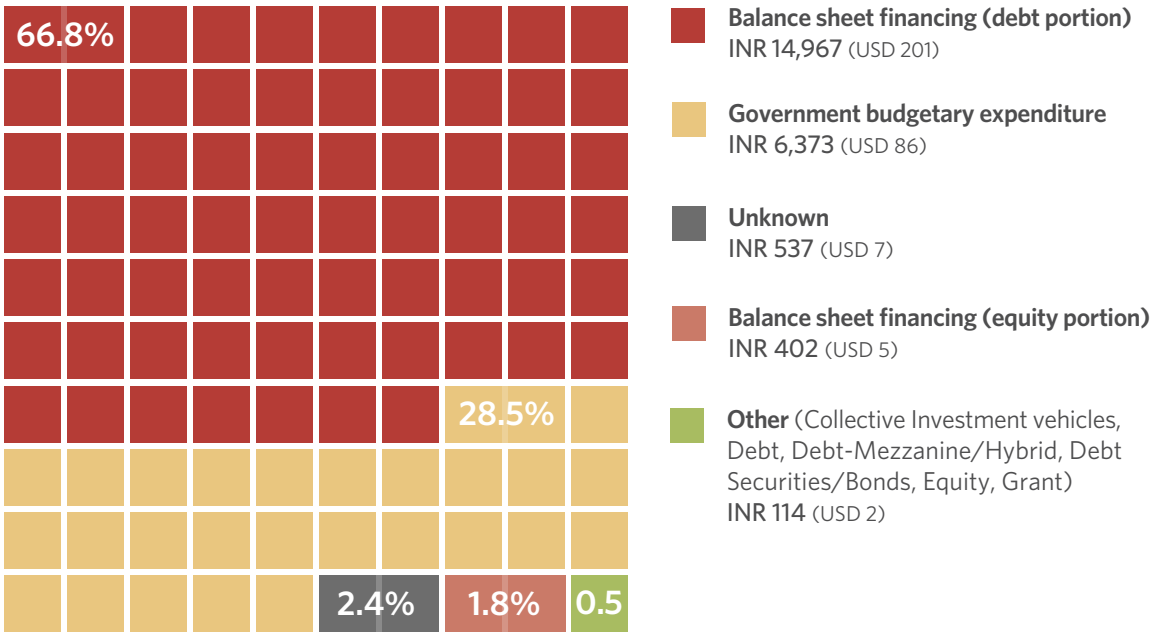
21 Modern agriculture refers to the application of modern technology, practices, and science to increase agricultural efficiency and reduce the need for natural resources.

4.3 INSTRUMENTS

The debt portion of balance sheet financing accounted for the largest share of tracked financial flows for sustainable agriculture (66.8%), followed by government budgetary expenditures (28.5%). The equity portion of balance sheet financing accounted for just 1.8%, and equity instruments accounted for 0.3%.

Figure 12: Sustainable agriculture finance flows by instruments

*All values are in **billions**.*



Balance sheet financing (debt portion) came entirely from domestic commercial FIs, which include scheduled commercial banks, regional rural banks, and cooperative banks. These entities are mandated by the RBI to direct 18% of their lending to agriculture as a priority sector. **A significant portion of flows through this instrument goes to agriculture/farming (89%), followed by upstream (8%) and downstream activities (3%).** These flows mostly support farm practice/cropping choices, allied activities, research (including technology and planning), storage/markets, and irrigation.

Government budgetary expenditure—a fully domestic source of finance—includes the collective spending of union, state, and union territory governments. **Of these flows, 54% goes to upstream activities, 41% to downstream activities, and 5% to agriculture/farming activities.**

The majority of balance sheet financing (equity portion) came from domestic sources (96%), with PSUs as the main providers. Domestic flows through this instrument contributed to the storage/market and input sectors. The remaining 4% of balance sheet equity flows came from FDI and went to inputs, research (technology and planning), storage/markets, farm practice/cropping choices, irrigation, and financial services (credit sectors).

Tracked equity finance largely came from international sources (61%), provided by multilateral DFIs and international PE/VC. The remaining 39% came from domestic PE/VC flows.

Grants provided a minuscule 0.3% of India's sustainable agriculture finance, coming entirely from international sources. Philanthropies accounted for 63% of these grants, and bilateral DFIs for 37%.

Box 5: Carbon markets for sustainable agriculture

The emergence of carbon credit initiatives in India's agricultural sector presents a new avenue for climate change mitigation and sustainable farming. Carbon markets present an opportunity to reduce agricultural emissions and provide a financial buffer for farmers dealing with the impacts of climate change.

Such initiatives can provide social, environmental, and financial benefits to stakeholders across the agricultural value chain. Implementing sustainable agricultural practices could potentially contribute to an 84% reduction in annual emissions from Indian agriculture between 2019 and 2070. This will depend on overcoming key hurdles in the adoption of carbon credit systems, including policy, economic, and technical challenges (Khurana et al. 2024).

Practices such as zero tillage farming, biochar production and use, and improved nutrient management through judicious use of fertilizers enhance soil health and significantly increase carbon storage capacity (Rosa & Gabrielli 2023). This can simultaneously address climate mitigation goals and enhance agricultural sustainability while potentially providing economic benefits to farmers and other agricultural stakeholders.

Voluntary carbon markets are picking up pace in India, with 143 projects in VERRA's AFOLU project list, placing it only second to China which has 170 (Verra 2024) at the time of writing.[22] However, challenges remain in terms of tracking, uniformity in pricing, and cost of compliance. Ensuring the accuracy of the carbon sequestration of smallholder farms can be complex and expensive.

The establishment of the Carbon Credit and Trading Scheme (CCTS), notified by the Government of India in June 2023, marks a significant step toward integrating agriculture into the nation's climate strategy (MoEFCC 2023), leveling the playing field for all participants. This aims to create a regulatory framework for carbon credit trading and mandates high-emission sectors to purchase credits, which may include those generated by sustainable agriculture.

22 Data retrieved from VERRA's Agriculture, Forestry, and Other Land Use (AFOLU) project list as of November 2024 and excludes projects that are inactive, on hold, rejected and withdrawn. See: https://registry.verra.org/

5. OPPORTUNITIES FOR ACTION

India's sustainable agriculture finance ecosystem faces macro-level policy, regulatory, and institutional challenges. There is a need for a unified, comprehensive definition of sustainable agriculture that incorporates a value-chain perspective serving the regulatory, financial, and policy domains. Financial flows for sustainable agriculture—averaging USD 301 billion per year over FY 2020-21 and FY 2021-22—are heavily skewed, with 67% coming from private sources and 33% from public sources.

There is a need to create a more balanced and resilient financial ecosystem for the sector. Even within private flows, commercial FIs account for 99.4%, while government budgets account for 87% of public flows. Furthermore, international flows for India's sustainable agriculture remain extremely low, accounting for just 0.5%. Diversifying finance flows is necessary to reduce this over-concentration and create a more balanced and resilient financial ecosystem for the sector. This requires increasing the participation of underrepresented financial actors, such as DFIs, philanthropic investors, and PE/VC firms, while also encouraging international funding. Additionally, greater emphasis must be placed on channeling funds to a more diverse range of agricultural sectors through varied and targeted modes of finance to address financially underserved areas.

At a more granular level, a substantial share of funds was concentrated in a limited number of sectors, leaving other critical sectors lacking adequate financial support. Farm practices and cropping choices received 53% of flows, and storage and market activities received 16%. Meanwhile, the agricultural inputs sector received just 7% and irrigation 6% of total flows. Other sectors integral to sustainability and climate resilience also lacked funding, including farmer organizations and cooperatives (0.2%), research and technology (4%), electricity (0.1%), alternative supply chain (waste management and bioethanol) (0.02%), natural capital (soil and biodiversity) (0.1%), and extension services (0.32%). Examining the distribution of funding among activities and sectors could support the holistic advancement of sustainable agriculture through a more value-chain-focused approach.

Furthermore, India's sustainable agriculture finance landscape must increase the diversity of instruments and intermediaries. FDI, philanthropy, and PE/VC cumulatively contributed to just 0.6% of private finance, while bilateral and multilateral DFIs account for just 0.6% of public flows. Increasing the participation of such actors in the funding base will boost the sector's ability to adapt to emerging challenges. Additionally, financial flows are dominated by debt (67%), leaving vast scope to increase access to equity (currently at 0.3%) and grants (currently 0.03%). Diversifying the use of financial instruments could increase access to flexible and innovative funding.

India's sustainable agriculture sector also requires ecosystem-building efforts related to capacity building and data monitoring and reporting. While there are many government initiatives for farmer training, the vast scale of the country's agriculture sector and lack of localized approaches hinder the adoption of sustainable practices. More training and capacity building for all stakeholders—policymakers, regulators, commercial FIs, and farmer organizations—could help to drive larger systemic change. Additionally, addressing the significant data monitoring and reporting gaps—particularly regarding private debt disbursements, non-priority-sector lending

credit, and the comprehensive tracking of FDI flows—can support effective financial oversight and decision-making in the sector.

In light of the complexity of challenges and the diverse array of stakeholders, this study identified four key pillars of opportunity to enhance and diversify financial flows for sustainable agriculture in India.

Pillar 1: Sustainable agriculture tagging

- **Creation of a comprehensive sustainable agriculture taxonomy** encompassing different agricultural activities, geographical conditions, and climate risks is vital for setting standards and driving innovation. India's diverse agricultural activities and sectors should be cataloged and evaluated consistently, with their performance calibrated against sustainability and climate challenges to establish a clear taxonomy (CFA Institute 2021).[44] This exercise should be integrated with the ongoing codification of climate finance taxonomy (PIB 2024c), with careful consideration of data availability and tagging constraints to ensure effectiveness and feasibility.

Pillar 2: Monitoring and reporting systems for comprehensive and granular data

- **Building a robust monitoring and reporting system** is critical for filling the data gaps for sustainable agriculture finance. This also includes strengthening the overall disclosures for the FIs in India. Such a system will enable comprehensive evaluation through reporting and enhance transparency through the availability of granular end-user data. Additionally, leveraging such data and technology can greatly improve financial system access for farmers and the formalization of the agricultural fintech sector.
- **Promoting digital platforms that provide real-time data on crop yields, weather patterns, and soil health**[23] is also crucial for enhancing credit models, helping FIs to assess climate risk more accurately. Such unified platforms can use technology to provide **agrometeorological advisory services to help farmers** make informed decisions, thereby boosting productivity while reducing climate risks (MoEFCC 2023).[33]

Pillar 3: Boosting and diversifying financial flows in lagging sectors

- Promoting a **value-chain financing model that integrates various stakeholders**—farmers, aggregators, traders, processors, and FIs—can improve efficiency across the agricultural value chain. A focused approach to integrating value-chain financing and expanding institutional credit in underserved sectors will foster a more resilient and sustainable agricultural system (Swaminathan 2024).
- **Enhancing credit risk-mitigation structures for agriculture financiers through refinancing and guarantee programs—**products such as weather-indexed insurance and sustainable farming equipment leasing aimed at de-risking the agriculture sector may be evaluated for broader adoption. For example, the revamping of the Restructured Weather Based Crop Insurance Scheme in 2020 was a welcome step toward mitigating climate risks in the agriculture sector. It is also recommended that the **coverage should be expanded to cover allied sectors**. Moreover, reducing the mismatch between payouts and the actual

23 On 1 January, 2025, the union cabinet chaired by the Hon'ble Prime Minister approved creation of Fund for Innovation and Technology (FIAT) aimed at funding technological initiatives. Technology-driven systems like YES-TECH and WINDS are being implemented to enhance yield estimation and weather monitoring in agriculture using remote sensing and automated weather stations.

losses experienced by farmers by strengthening weather data infrastructure, particularly by **expanding the network of Virtual Weather Stations** (Vishnoi et al. 2020), would encourage accelerated adoption.

- **Expanding the use of innovative financial instruments and blended finance products, supported by DFIs and philanthropies**, can provide affordable finance to innovative agritech companies, enabling them to scale up and deliver sustainable agriculture solutions. This approach can also fund pilot projects through sustainability-focused farmer-producer companies, accelerating the adoption of climate-resilient practices.
- **Enhancing government grants and other budgetary support for sustainable agriculture research** can unlock future value, especially in developing indigenous agritech solutions. According to India's Economic Survey 2024 (DEA 2024), every rupee invested in agricultural research (including for education and training) yields a return of INR 13.85, emphasizing the importance of research, development, and education in enhancing farm productivity and sustainability.

Pillar 4: Capacity building for sustainable agriculture

- Creating awareness initiatives and building the capacity of local communities and farmer-producer organizations around sustainability issues requires India to **expand digital resources, including mobile-accessible training in sustainable agriculture**, for broader reach and create region-specific programs supporting local languages and conditions.
- **All stakeholders in the sustainable agriculture finance ecosystem require training and capacity building** to better understand associated risks and opportunities. While the government is promoting FPO capacity-building and climate-resilient technology adoption, and regulators are increasingly focusing on climate risks, more focused efforts are essential for scaling up training and capacity-building. Scaling up initiatives that could enhance funding channels and drive greater impact for sustainable practices will necessitate support and contributions from DFIs, philanthropic organizations, and governments. This collaborative effort would strengthen sustainable agriculture capacity at all levels and promote resilient systems across the country.

The above four pillars of opportunity can spur a systemic transformation of India's agriculture finance ecosystem to support the three objectives of sustainable agriculture—ensuring food security, reducing GHG emissions, and enhancing climate resilience.

6. AREAS FOR FUTURE RESEARCH

1. **State-level financial flows:** India's agricultural diversity requires financial models and support systems that are adapted to each state's unique challenges, from soil conditions to prevalent crops and climate vulnerabilities (Bisht et al. 2020). Additionally, climate adaptation needs and sustainability challenges are localized. With each state in India presenting a unique ecosystem of farming cycles, agricultural practices, sustainability challenges, and climate risks, state-specific studies can provide more precise insights into the financial needs and potential growth areas in different agricultural contexts.
2. **Financing for small and marginal farmers by promoting self-help groups (SHGs), farmer-producer organizations, and microfinance institutions (MFIs):** The key to extending credit access, knowledge sharing, and marketing to underserved farmer segments. SHGs and MFIs are crucial in supporting income stability, fostering collective marketing, and enhancing access to markets for small landholders. The importance of these groups in aggregating smallholders' produce and providing essential risk-mitigation tools through collective resources and training initiatives is invaluable (World Bank 2020). Understanding and optimizing these financing channels can provide deeper insights into improving financial inclusion and promoting sustainable agricultural practices among small and marginal farmers across India.
3. **Uncovering the nuances and synergy of public-private financial flows:** The report highlights that private finance accounts for two-thirds of the total financial flows toward sustainable agriculture. Of this private finance, commercial FIs (in the banking sector) constitute the majority share due to RBI's priority-sector lending mandates. This heavy reliance on commercial FIs distorts private sector engagement in sustainable agriculture. If these commercial FIs are excluded, public finance emerges as the greatest financial contributor. Future research should delve deeper into identifying sectors and end-uses that lack funding, exploring how public-private synergies can better address these gaps.

7. ANNEXURES

1: PHASES OF INDIA'S NATIONAL AGRICULTURE POLICY

Phase	Period	Summary
1: Pre-Green Revolution	**1950/51 to mid-1960s**	A phase of agrarian reforms and institutional changes, including the abolition of intermediary landlordism to provide tenants with security in farming and land ownership. During this period, agricultural growth was primarily driven by the expansion of cultivated land and the development of major irrigation projects.
2: Green Revolution	**Mid-1960s to 1980**	During this period, technological breakthroughs drove increased productivity in the form of crop outputs, with significant advancements in wheat and rice yields. Agrarian reforms took a backseat as policymakers prioritized research, extension services, input supply, credit, marketing, price support, and the dissemination of new technologies to boost agricultural productivity.
3: Post-Green Revolution	**1980s to 1990**	During this period, output growth that had initially been concentrated in narrow areas became more widespread, fueling rural economic diversification, particularly in non-grain sectors like milk, fisheries, poultry, vegetables, and fruits, boosting agricultural GDP. Green Revolution technologies expanded to other crops and regions, and ongoing research on pulses, oilseeds, and coarse grains began to positively impact drier areas.
4: Economic Reforms	**1991 to 2000**	From 1991, India's agricultural policy shifted toward improving market functionality, reducing excessive legislation, and liberalizing trade. Broader economic reforms in the 1990s initially largely bypassed agriculture, but later trade policies aimed to liberalize agricultural exports and imports. Challenges included reversing a decline in output growth in the late 1990s and ensuring sustainable natural resource use. A decline in public investment in agriculture prompted the need for private sector involvement while improving competitiveness across agriculture value chains, particularly in production, marketing, and processing, became a key focus.

2: LINKING POLICIES WITH SUSTAINABLE AGRICULTURE OBJECTIVES

Objective	Policies Literature
Food Security	• *"...increase cropping intensity through multi-cropping and inter-cropping."* **(NAP 2000)** • *"...develop a long-term sustainable perspective plan for rainfed agriculture through the watershed approach."* **(NAP 2000)** • *"Watershed management programmes yield multiple benefits, such as sustainable production, resource conservation, groundwater recharge, drought moderation, employment generation and social equity..."* **(1st NC)** • *"Development of animal husbandry, poultry, dairying and aquaculture will receive a high priority in the efforts for diversifying agriculture..."* **(NAP 2000)** • *"...enhance food security, while at the same time, there have been focused interventions aimed at diversifying Indian agriculture into non-food grain crops and promoting animal husbandry and fishing"* **(1st BUR)** • *"...Raise the cropping intensity of the existing agricultural land."* **(1st NC)** • *"...enhance food security, while at the same time, there have been focused interventions aimed at diversifying Indian agriculture into non-food grain crops and promoting animal husbandry and fishing"* **(1ST BUR)** • *"Selective and eco-friendly farm mechanization through appropriate technology will be promoted, with special reference to rainfed farming to reduce arduous work and to make agriculture efficient and competitive as also to increase crop productivity."* **(NAP 2000)** • On resource conservation technology, *"...results in higher yields, less weed growth, reduced use of natural resources such as fuel and steel for tractor parts, and improvements in efficiency of water and fertilizers."* **(1st NC)** • On augmenting production and its sustainability, the focus needs to be on high yield potential areas with *"...institutional support in the form of improved extension services, markets and infrastructure need to be provided in such regions to increase stability and bridge yield gaps."* **(1st NC)** • Focus on crop diversification with *"to divert the area under water-intensive paddy to alternative crops like pulses, oilseeds, maize, cotton and to agroforestry plantation with the objective of tackling the problem of declining soil fertility and depleting water table"* **(3rd BUR)**
Reducing GHG Emissions	• On resource-conserving technologies like zero tillage, *"...restrict the release of soil carbon, thus mitigating the increase of CO_2 in the atmosphere."* **(1st NC)** • *"...climate-friendly initiatives in the agriculture sector include the standardization of fuel-efficient irrigation pump-sets, retrofitting existing pump-sets for higher energy efficiency, better water and crop management, improved cultivars, more efficient application of synthetic fertilizers, enhanced organic fertilizer use, improved animal feeds and digesters, and rationalization of power tariffs for the agriculture sector. Many of these measures would serve to reduce CO_2, methane and N_2O emissions."* **(1ST NC)** • Initiatives like NICRA that "focus of mitigation interventions in the project is on quantifying the GHG emissions from various important production systems of the country using state of the art equipment, development of management practices for reducing GHG emissions" **(1st BUR)** • "*The government has also proposed complementary actions in terms of identification of cost-effective opportunities for reducing methane generation, emissions in ruminants by modification of diet, and in rice paddies by water and nutrient management.*" **(1st BUR)** • *"Improved crop seed, nutrient management, soil health management and the on-farm water management components of the NMSA have the potential to reduce the GHG emissions..."* **(1ST BUR)** • "*Expansion of area under horticulture systems: The horticulture sector encompasses a wide range of crops such as fruits, vegetables, flowers, spices and nuts. The fruit crops produce relatively higher biomass and are retained in the field for a relatively longer period, and thus sequester carbon both above and below ground.* **(1st BUR)** • For livestock sector, *"...balanced ration for livestock that contributes to improving animal productivity as well as in reducing both the cost of production and the emission of GHGs per unit of animal product."* **(2nd BUR)** • Using PM Krishi Sinchayee Yojana, *"...convergence of investments in irrigation at the field level, expand the cultivable area under assured irrigation, improve on-farm water use efficiency to reduce wastage of water, enhance the adoption of precision irrigation and other water saving technologies (more crop per drop) and enhance recharge of aquifers. It has resulted in an emissions reduction of 22.82 MtCO2."* **(2nd BUR)**

Objective	Policies Literature
Climate Resilience	▪ *"A regionally differentiated strategy will be pursued, taking into account the agronomic, climatic and environmental conditions to realize the full growth potential of every region."* **(NAP 2000)** ▪ *"...rational utilization and conservation of the country's abundant water resources will be promoted."* **(NAP 2000)** ▪ *"...to increased water stress can be reduced through the participation of farmers in improved management of irrigation, adopting local rainwater harvesting systems, watershed development, low-cost drip irrigation, resource conserving technologies, such as zero tillage, bed planting, and adoption of multiple crops or crop diversification, etc."* **(1st NC)** ▪ On altering the agronomy of crops, *"Small changes in climatic parameters can often be managed reasonably well by altering the dates of planting, spacing and input management. Alternate crops or cultivars more adapted to the changed environment can further ease the pressure."* **(1st NC)** ▪ On improved risk management through early warning system and crop insurance, *"...policies that encourage crop insurance can provide protection to farmers in the event their farm production is reduced due to natural calamities.... useful to have an early warning system of environmental changes and their spatial and temporal magnitude."* **(1st NC)** ▪ On soil conservation, *"Balanced and optimum use of fertilizers will be promoted together with use of organic manures and bio-fertilizers to optimize the efficiency of nutrient use."* **(NAP 2000)** ▪ *"...financial compensation/incentive for green manuring should be evolved that would encourage farmers to enrich organic matter in the soil and, thus, improve soil health."* **(1ST NC)**

**NAP=National Agricultural Policy; NC=National Communication; BUR=Biennial Update Report*

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